WORLD PETROLEUM

JANUARY 1960

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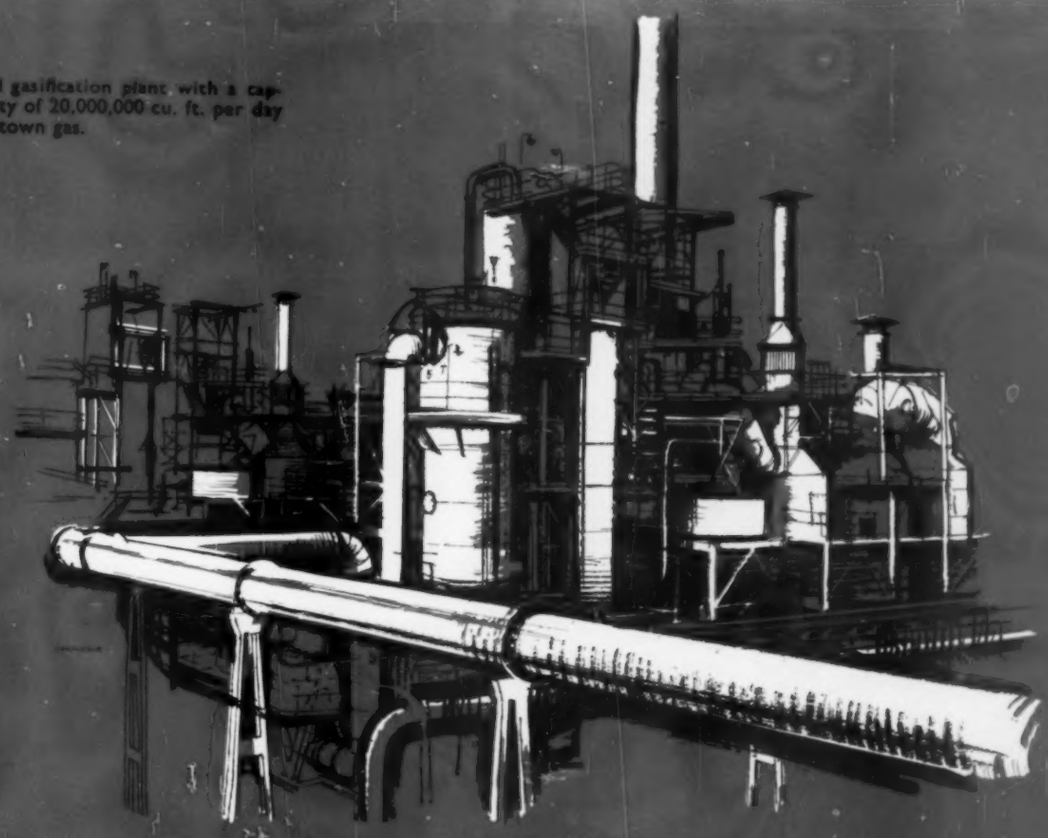

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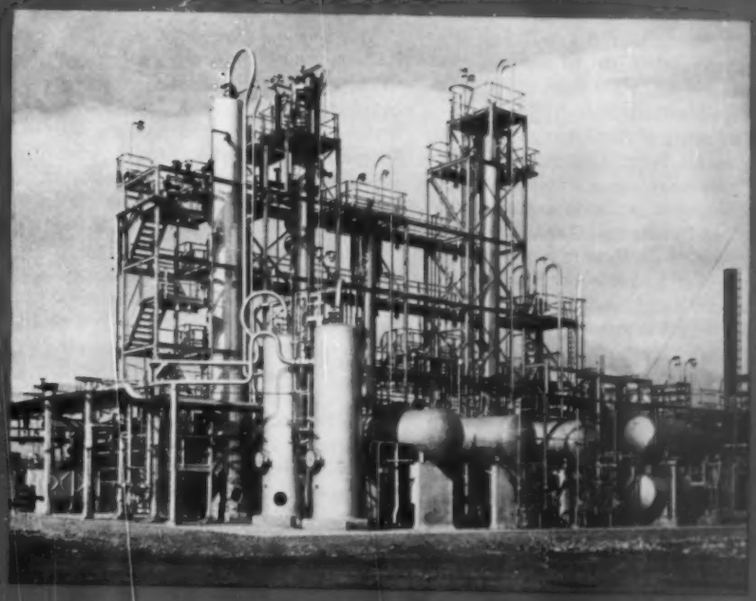
Amine washing plant with mercaptan removal unit treating hydrocarbon streams at a refinery.



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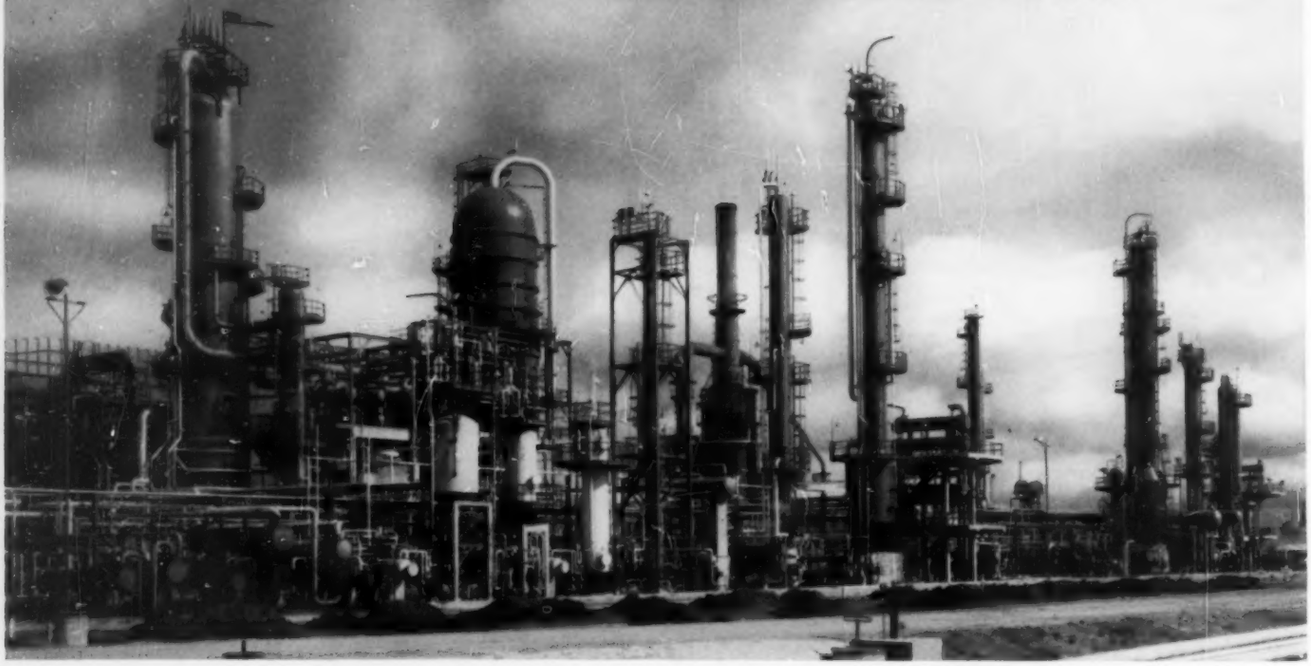
422

LUMMUS ENGINEERS, CONSTRUCTS NEW 31,500 BARREL PER DAY REFINERY FOR ESSO STANDARD S.A.F. AT BORDEAUX



When Lummus completed construction this spring of Esso Standard's new Bordeaux refinery, it added 31,500 barrels per calendar day to France's refining capacity. The new Bordeaux installation is also the first refinery designed and built to operate on French crude. Crude flows through a 12" pipeline from Esso-REP's Parentis field south of Bordeaux.

In recent years *existing* refineries in France have expanded greatly. The new Bordeaux refinery, on the other hand, is a "grass roots" refinery – the second built in France since World War II–and Lummus has handled the engineering and construction of both.

Although the refinery will operate at 31,500 barrels per day initially, facilities are designed to permit expansion to a 45,800 B/D throughput at minimum cost.

The refinery's design permits production of LPG, motor gasolines, jet fuels, kerosene, diesel fuels, heating oils, light and heavy fuel oil, and asphalts. Automatic blending equipment has been included to produce the various grades of asphalt required for the French market.

The Bordeaux refinery uses Esso Research and Engineering's "Hydro-Skimming" processing plan, which consists of atmospheric and vacuum distillation, with Hydrofining and Powerforming to produce the required gasolines. Light ends and treating sections are also included for both the pipestill and Powerformer.

In addition to product shipping facilities, Lummus also provided complete auxiliary and off-site facilities, including storage tanks, steam generation, cooling water, electric power, and air – plus the necessary piping, transfer pumping and TEL blending.

The Bordeaux project was handled by Lummus' French company, Societé Française des Techniques Lummus, with specialists from Lummus in the United States teaming up with those from Paris.

For design, engineering and construction of refineries anywhere in the world, contact one of the eight Lummus offices – and draw on more than 50 years' experience on over 800 major installations.

On the unusual heater exhaust system shown above, all vertical heaters exhaust into diagonal flues which feed one central stack.

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THE MANAGEMENT PUBLICATION OF THE INTERNATIONAL PETROLEUM INDUSTRY

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THIS MONTH'S COVER

"Winter in Holland" by the Dutch artist Marten Boom was executed in water colors for G. Dikkers & Company, N.V., Henglo, through whose courtesy the painting is reproduced.

Washington PIPE LINE

by Joseph B. Huttlinger

Tidelands Decision

The U.S. Supreme Court once again is about to make a decision on ownership of the oil and gas wealth in the submerged lands off the coasts of the five Gulf Coast states. This time, however, there is a difference. Back when the issue was in the news after World War II, the oil industry was very much in the fight, on the side of the states.

This time, oil and gas executives have played a hands off role. "What difference does it make to me who is my landlord?" one oil man explained. "I'll have to pay about the same rent whether the federal government or the states own the lands."

The current legal scrap is over ownership of the belt from three miles to three leagues, 10.5 miles, from the coast in the Gulf of Mexico.

On all coasts, the states have the ownership out to three miles. In the Gulf they also have out to 10.5 miles if they can prove that was their boundary at the time they entered the union or if approved by the Congress.

Texas seems to have a fighting chance to 10.5 miles, on the basis or her boundary act of 1836, nine years before she joined the union. Florida seems to have a slimmer chance on the basis of her Constitution of 1868 paving the way for representation in the Congress after the Civil war. Louisiana, Mississippi and Alabama claims rest on enabling act wording, paving the way for statehood, defining their areas as "including all islands" out to three leagues in some cases and six leagues in others, from the shore or the coast.

J. Lee Rankin, Solicitor General of the U.S. asserted that the court should decide the question on the basis of national policy and foreign relations. He said that it is clear no state can own more than the U.S. as a whole, and that the U.S. boundary historically has been three miles. A court decision is expected in the near future, and surely before the end of the current term of the court next summer.

FPC May Set Gas Price

To ease up federal price and other controls over independent producers of gas, the Federal Power Commission is reported dusting off a proposal calling for price control over independent producers of gas on the basis of going prices in areas.

In effect, the commission would propose that the price it would allow a gas producer in a known producing area is, say, 16 cents. Any producer in the area would be allowed this price, almost automatically. In another area the price might be 21 cents; in still another, it might be 13 cents. A producer who arranges to sell at a higher price would have the right to come to the commission and prove his costs and try to get the higher price.

Commissioner Frederick Stueck of the FPC said this solution "could be possible." An area price basis would not solve all the problems of producers, so a bill would still be sought. At the same time, it could take the steam out of the drive for a bill to ease up the controls.

Depletion Defense

A reduction in the income tax depletion allowance for crude oil and natural gas production would bring an immediate drop of 25% or 12,500 wells a year in drilling, the U.S. Congress was told by Richard J. Gonzalez, treasurer and director of Humble Oil and Refining Co., Houston, Texas, in a vigorous and sweeping defense of the tax provision which he credited with making plenty of oil available in times of peace and war.

Gonzalez took part in a panel hearing on depletion before the committee.

Nine others on the panel included Scott C. Lambert of Standard Oil Co. (Calif.) who defended the tax provision as it applies to oil operations outside the United States; three critics of depletion from the world of universities and the law; two professors who are to indulge in theoretical explanations of the provision, and three witnesses from iron ore, lead and zinc and coal producing industries. The papers of all members of the panel were made public along with scores of papers on other phases of the tax situation.

Gonzalez said that a cut from 27.5%, the rate in effect since 1926 and continued by congress despite attacks on it as excessive, down to 15% would bring an additional $390 million in revenue according to first estimates by the Treasury Department. He said: "Operators would have to curtail drilling by at least 8,000 wells annually, based on an average cost of $50,000 per well, to offset the additional tax burden."

"Furthermore, the lower rate of return and the fear of still further reductions in percentage depletion, would impair incentive to invest and also the ability of operators to secure outside capital from investors and lenders. Therefore, drilling might decline much more.

"At the current rate of about 50,000 wells annually, drilling is already down by 15% from 1956 as a result of other economic factors.

"If the long-term outlook for profits from production were now permanently affected by a cut in depletion, a further drop in drilling of about 25% might take place, causing well completions to decline by 12,500 wells annually."

Gonzalez estimated that half of all new wells are completed as oil wells and that each oil well develops about 125,000 barrels. "Therefore, the minimum reduction in drilling would cut back the development of new crude oil reserves by about 500 million barrels of crude oil annually."

He said the average barrel of oil accounts for about $2.07 in direct taxes on the crude oil and its products, so the potential tax loss to the Treasury would be about one billion dollars a year.

Gonzalez took up a main point of critics of depletion, that oil and gas production is "unduly profitable." This, he said, is not borne out by the evidence. While some producers have luck and make a lot of money, others lose their shirts, he said. On an industry-wide basis, oil and gas production is not more profitable than other industries. He said, "the inevitably of large losses on unsuccessful ventures means that there must be the opportunity in case of exceptional success for commensurate rewards in order to provide a reasonable incentive for funds to be risked in this business."

U.S. Price Case

The U.S. Department of Justice has lined up Joseph E. McDowell to handle the trial of the government's oil price case against 29 oil companies. Trial of the case, which grew out of price rises following the closing of the Suez Canal, is set to start Jan. 18 at U.S. District Court at Tulsa, Okla.

Mr. McDowell was chief government attorney in presenting the facts to the federal grand jury at Alexandria, Va., which returned the indictment against the companies.

NPC Still Alive

The National Petroleum Council seems to be in business again, although under new rules that call for a government official to be co-chairman. Walter S. Hallanan of Plymouth Oil Co., industry co-chairman, told members that Capt. Matthew V. Carson, Jr., director of the Office of Oil and Gas of the Department of the Interior, who is the government co-chairman, has been "most cooperative."

At its first meeting under the new rules, urged by Secretary of the Interior Fred A. Seaton, the council not only made a major report—its views on an oil and gas mobilization plan for oil in case of war—but agreed to make two new studies asked by the government.

The council agreed: 1. To make "a thorough study of the maintenance supplies and process chemicals needed to keep a refinery operating." The emphasis would be on supplies needed "under short range emergency conditions." One aim is to identify items kept in less than three months supply. 2. To make a report of proved crude oil reserves by years through 1954, using the API estimates of crude oil reserves as of Dec. 31, 1959, as a base and crediting such reserves back to the year of discovery, substantially as was done by Petroleum Administration for War in World War II. The council is to include, if possible, drilled and undrilled proved acreage data as of Dec. 31, 1959.

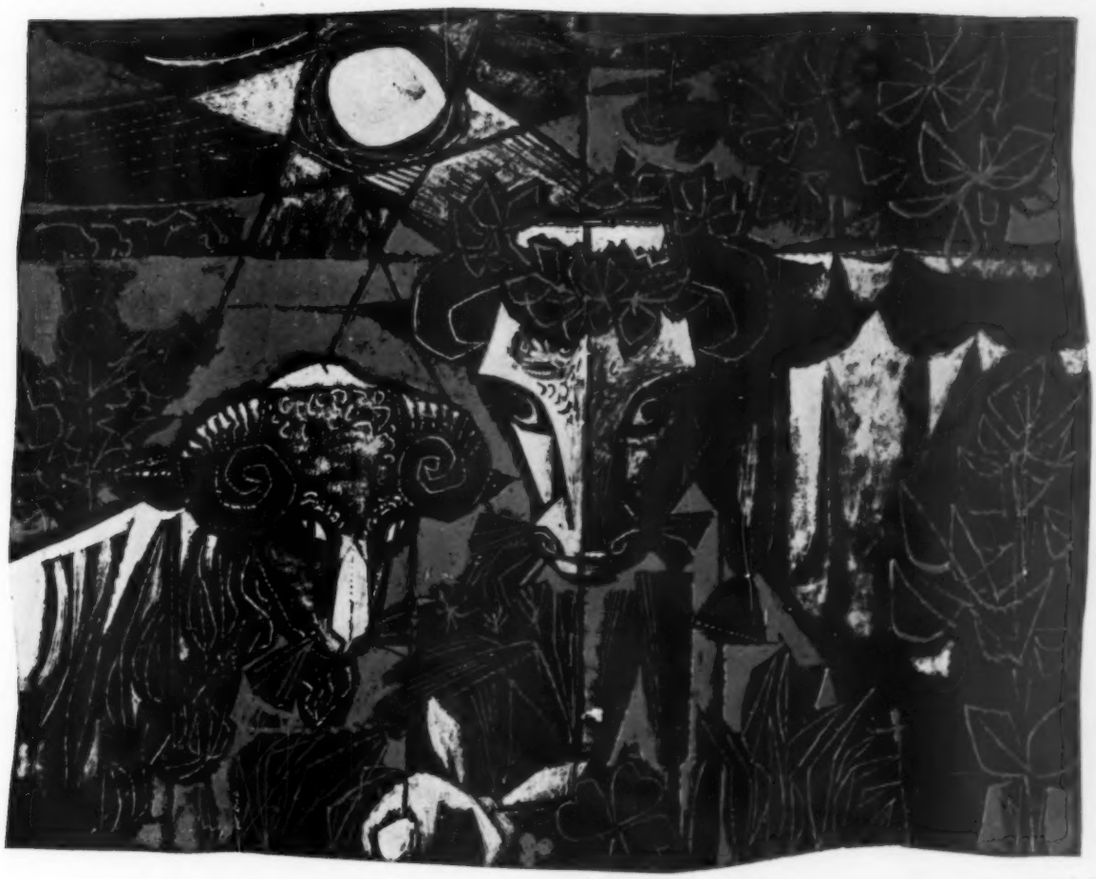
At the next council meeting, in 1960, it was promised, committees on petroleum storage facilities and use of radio and radar are to present to the council finished reports.

The National Petroleum Council has furnished the government a list of 868 names of industry executives whom it feels are qualified to play roles in any government mobilization setup for oil and gas. The list includes 517 persons nominated to serve in regional offices of the mobilization agency and 351 suggested for the national headquarters. The NPC submitted several names for each top posts, to give the government a choice.

Oil industry leaders want to answer directly to the Secretary of the Interior in the event of a war that calls for mobilization of the industry. This was the main suggestion of the Council commmittee formed to comment upon a proposed war plan for oil and gas. In other words, oil men want access to the top man, rather than being channeled through one or more of his assistants at lower levels.

The 100-man council, composed of some of the top figures in the oil and gas world, also said the proposed plan should provide for antitrust clearance to permit cooperation by oil and gas companies; define the legal status of oil men in the executive reserve; spell out the authority and duties of federal, state and city authorities; state the role of the military, and "specifically cite" the conditions which would trigger off the mobilization plan.

NATURE'S CATALYSTS (3)



Green grow the Carbohydrates

Without chlorophyll, life as we know it could not exist. It is the chief pigment in all green vegetable matter, and plays a vital catalytic role in photosynthesis, the process in which water and carbon dioxide combine in the presence of sunlight to form carbohydrates. Animals need carbohydrates but cannot synthesize them, and so depend ultimately on plants and their chlorophyll to provide these food materials.

By making possible a whole range of processes not found in nature, man-made catalysts play a correspondingly important role in modern chemical industry. Many such processes depend on I.C.I. catalysts, made available as the result of fundamental and practical research in I.C.I. laboratories.

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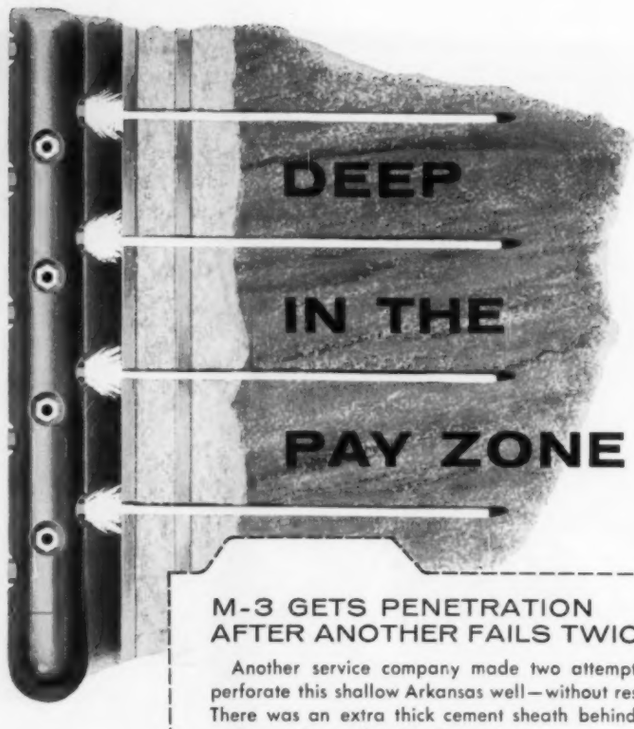

M-3 GETS PENETRATION AFTER ANOTHER FAILS TWICE*

Another service company made two attempts to perforate this shallow Arkansas well—without results. There was an extra thick cement sheath behind the casing at the perforating interval.

Well was reperforated with 24 improved ½" Ogival Bullets fired by a $5^{7}/_{16}$" OD McCullough M-3 Bullet Gun and is now pumping 10 barrels of oil daily—a normal well for the field.

Depth of operation was 2636'. Casing was 7" OD 20 lb. Operation required 2 hours rig time. Operator was well pleased with results obtained by M-3 Bullet Gun and also with time on job.

McCullough® M-3 BULLET GUNS

M-3's WILL OUTSHOOT any other bullet guns available. Their greater power has been demonstrated in competitive surface tests, in adjacent wells in the same oil field, and in wells where competition has tried and re-tried, as shown above. M-3's consistently get more oil. They'll penetrate excessive thicknesses of casing and cement and get production—even after others have failed.

M-3's EVENLY SPACED, DEEP PERFORATIONS result from McCullough's exclusive firing method—"simultaneous" progressive pressure firing. Shots are fired very rapidly, progressively from top to bottom, at one firing. The M-3 Gun does not have time to "jump" due to the micro-second firing interval from shot to shot, thus perforating pattern is uniform. There is no damage to casing since all shots are fired progressively.

All "selectively fired" single-shot firing guns will "jump" with each shot fired, producing random spacing and scattering of perforations; unfired shots remaining in a selectively fired gun will develop leaks, dampening of powder loads, and loosening of electrical connections thereby causing inferior penetration for succeeding shots.

***The job described above is certified to be a true field report of service rendered.**

Check these "plus" values you get only in M-3 Guns:

- *Uniform hole spacing in casing—most important to avoid casing damage.*
- *All shots fire progressively—gun at rest in selected zone.*
- *Guns fire one to 6 shots per foot.*
- *Up to 30' of guns may be run at one time, perforating 30' of zone in one run—number of holes per foot desired.*
- *Improved Ogival Bullets give best penetration—proved in steel, Berea Sandstone and through multiple casings.*
- *Strongest, safest gun body made—demonstrated in competitive endurance tests.*

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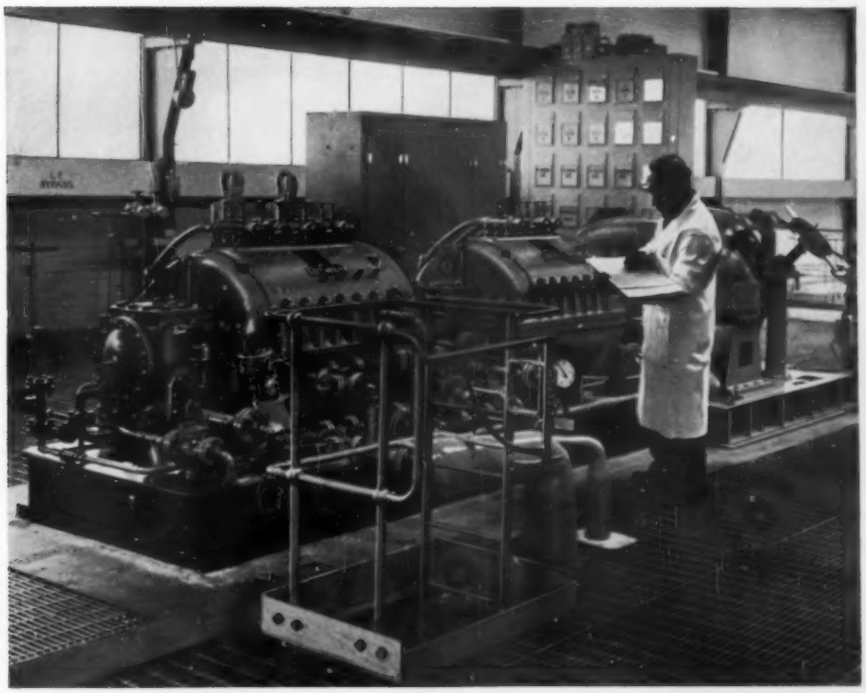
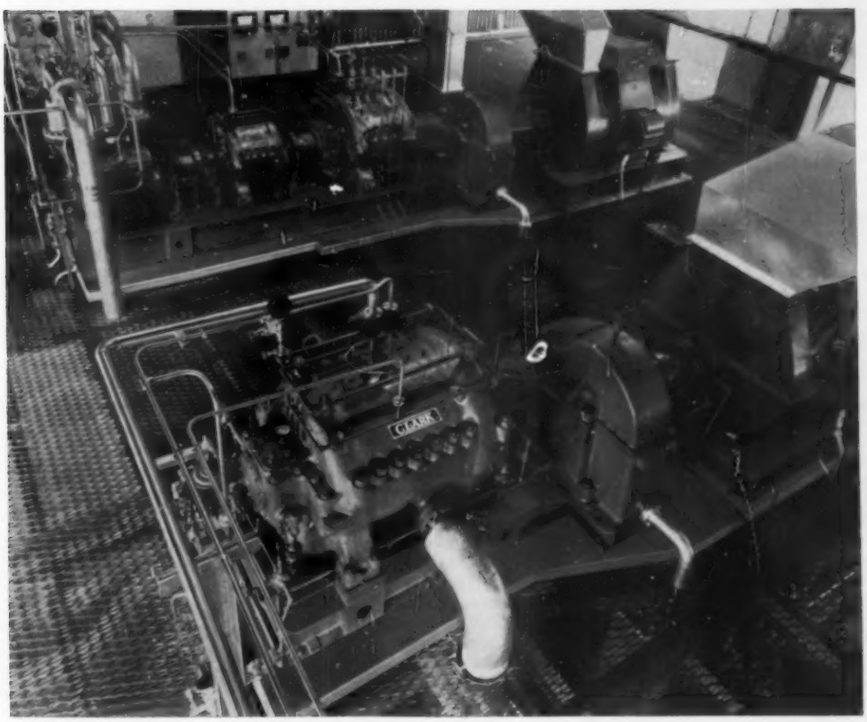


FOR ICI AT WILTON—

Twin strings of Clark compressors, each consisting of two multi-stage centrifugal units, handle 5597 cfm each of low pressure hydrocarbon gas at the No. 3 olefine plant of Imperial Chemical Industries, Ltd., Wilton, England. Drivers are Brush expansion turbines, each developing 1750 bhp at 8900 RPM. Discharge pressure is 222 psia with suction conditions near atmospheric. Confidence in the complete interchangeability of Clark compressor parts is expressed in the fact that one of these strings was produced in Olean, New York, U.S.A. and the other was manufactured under license in Great Britain.

More Clark Centrifugals on the job in England

CLARK®



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FOR ESSO AT FAWLEY—

Three Clark centrifugal compressors at Esso refinery at Fawley are driven in tandem through speed increaser gear by 3500 bhp electric motor: 1st stage, No. 3 case 4-impeller 11,400 scfm at 8450 RPM; 2nd stage, No. 2 case 5-impeller 8960 scfm; 3rd stage, No. 1 case 7850 scfm.
and
Clark No. 3 case, 7-impeller centrifugal compressor equipped with pneumatically controlled variable inlet guide for propylene refrigeration duty on ethylene recovery, 1315 lbs./min. at suction temperature of minus 40° F, with one outlet and two inlet sidestreams. Driven at 6700 RPM through speed increaser gear by 3500 bhp electric motor.

LONDON LETTER

by Cecil W. Wood

The New Castrol House

The C. C. Wakefield and Co. group is now occupying its specially-built new London headquarters—Castrol House in Marylebone Road—occupying nearly an acre and with a gross floor area of 165,000 sq ft. Its 15-story central position, floodlit internally through opaque green glass panels, is a new London landmark. Below ground there is a fully-equipped garage for over 100 cars while on the 14th floor is a residential suite with five bedrooms for visiting group executives.

Many interesting features are incorporated. One is the use of acoustic ceilings formed of suspended perforated strips made of aluminum ribbon and stove enamelled in white—the first time this Scandinavian design has been used in Britain. An advantage is that is gives good accessibility to the services installed in the ceiling void. The entire building is heated invisibly by hot water tubes above the suspended ceiling. A pneumatic chute system, with dialing for the selection of destination, governs internal distribution of correspondence and documents.

Admiralty Oil Storage In Scotland

The Admiralty is to build a £3 million oil storage depot near Loch Striven in Scotland, with a deepwater jetty in the lock. This will be a part of the NATO strategic oil reserve.

More Finance For Tanker Building

A new British and American joint shipping venture is announced. Anglo-American Shipping Co.—formed in Bermuda in 1958 by Erling D. Naess—has raised £5 million in loan and ordinary capital from British and U. S. institutional investors to be used towards paying for the ships that will operate under Anglo-American Shipping. The company's fleet of five ships—four are still on order—will include two 87,500 dwt tankers building in Japan for delivery early 1961 and June 1962, respectively and having 15-year time charters to Stanvac, and a 47,000-ton tanker chartered for 5½ years to Caltex and building, at Amsterdam for December 1960 delivery. Cost is put at £4,285,000 each for the larger vessels and £2,935,000 for the smaller. The 87,500-tonners will be the largest tankers to sail under the British Flag.

U.S. Equipment Links

Associated Electrical Industries and Alco Products Inc. have announced that an arrangement has been made for joint collaboration in design, manufacture and sale of diesel-electric locomotives for world markets.

H. and E. Lintott Ltd., member of the Ayling Industries group, announces that the first contract received since its link-up with Born Engineering Co., of Tulsa, for the fabrication and sale of Born process heaters is fron Monsanto Chemical Co. Ltd. This is for two steam superheaters for use at Grangemouth. It is anticipated that part of the £500,000 factory building at Llanelly for Crawley Industrial Products Ltd., another Ayling company, will be used for the Monsanto order.

Mobil Oil's Largest Terminal

Mobil Oil Co. has recently opened a new 33-acre ocean terminal at Ellesmere Port, built at a cost of £1 million. This is linked to the Queen Elizabeth II oil dock by pipeline and has a storage capacity of 86,000 tons—34,000 tons for gasoline and diesel fuel, 13,000 tons gas oil, and 39,000 tons for bunker "C." It will relieve the Preston and Coventry terminals of much of their long-distance haulage. A special feature is the provision of in-line blending for three intermediate grades of fuel oil, and loading facilities permit 14 road tankers and 20 rail cars to be filled simultaneously. Main contractors were John Laing & Son Ltd., with responsibility for pipe work in the hands of H. K. Ferguson Co. of Great Britain Ltd. Tank construction was by William Neill & Son (St. Helens) Ltd. and Whessoe Ltd., and electrical work by Messrs. Holliday, Hall and Stinson.

Hydrofining For Crude Benzole

Contracts have been placed by Port Talbot Chemical Co.—formed jointly by the Steel Co. of Wales and Lincolnshire Chemical Co.—for the first hydrofining plant in Britain for producing pure benzene from coke oven crude benzole. Plant with a capacity of 4½ million gallons a day will be supplied by Lurgi, of Germany, but Simon-Carves Ltd. will be responsible for erection, procurement of British equipment, and the installation of electrical equipment and instrumentation.

Army's New Multi-Fuel Engines

Britain can claim to be the first country to develop a multi-fuel engine for military purposes, said Mr. Soames, War Minister, at a recent demonstration of army heavy and light vehicles equipped with engines which can operate on any fuel from high-grade petrol or kerosine to low-grade diesel oil or any mixture of these. The engines are said to combine the fuel economy of the diesel with a power/weight ratio comparable to a petrol engine. In fact, the minister claimed them to produce more power from a smaller unit than any diesel engine yet developed anywhere in the world. Three series of opposed piston 2-stroke engines, utilizing 2 crankshafts, have been produced by Leyland Motors and Rolls Royce to cover all military requirements and it is hoped to equip all army operational units with them. The demonstration also showed how the normal commercial vehicle diesel engine can easily be made to work on the multi-fuel principle.

Eagle And Shell Fleets Integrated

The Canadian Eagle fleet of 23 ocean-going tankers and 3 coastal vessels totaling 450,000 dwt has been integrated since the end of 1959 with the Shell fleet. The entire assets and business of the Canadian Eagle group were acquired last July by Royal Dutch and "Shell" Transport & Trading but, after careful consideration, it was found impracticable to continue the existence of the Eagle fleet as a separate entity on a basis consistent with its history and tradition.

New Shell Plastics Laboratory

Shell Chemical Co. is to establish a plastics laboratory at its Carrington works near Manchester to support the manufacture and marketing of polystyrene and high-density polyethylene as well as future polypropylene and low-density polyethylene production. J. Hartly, assistant manager since 1957 of the research laboratory at Carrington, has been appointed manager of the plastics laboratory, which is expected to be completed in 1961.

New Heat Transfer Medium

Imperial Chemical Industries has added "Thermex" heat transfer medium to its range of phenol derivatives, a eutectic mixture of 73.5% diphenyloxide and 26.5% diphenyl and the first medium of this type to be made commercially in the UK.

Its properties are said to make it particularly suitable for liquid and vapor-phase heating and cooling in industrial processes: high boiling point (255 C), low freezing point (12 C), and excellent thermal stability up to 400 C for long periods. Other advantages are high high transfer coefficients, non-corrosiveness, negligible fire risk, and the ability to operate at high temperatures at low working pressures. At 350 C, for example, the gauge pressure of steam is 2,385 psi while that of "Thermex" is only 80. In fact very accurate temperature control can be achieved by pressure regulation, and a "Thermex" boiler can be used for several different consuming points simultaneously by pressure adjustment at each point to give the desired temperature.

British Equipment Notes

Lafarge Aluminous Cement Co. Ltd., manufacturers of Ciment Fondu aluminous cement, has been appointed main distributor of the first British-made super sulfated cement. This is made by Frodingham Cement Co. from a granulated slag of unusually consistent composition.

Vosper Ltd., Portsmouth, has received a further "Shell" order for its high-speed launches. This is from Shell Tankers for two 53-ft, all-welded aluminum alloy passenger launches with a speed of 28 knots. Powered by two Rolls Royce 330 hp marine engines, these will be used for carrying up to 28 on Lake Maracaibo.

Sunvic Controls Ltd. has combined with Metropolitan-Vickers Electrical Co.'s instrument and meter, scientific apparatus and X-ray departments to form the new instrumentation division of Associated Electrical Industries Ltd.

Halliburton Ltd., worldwide oilfield operators, has taken delivery of its first especially built British-made vehicle. This is a "Trusty" tractor made by *Transport Equipment (Thornycroft) Ltd.* with a Dyson semi-trailer and platform with troughs each side for gin poles. This will be used in operations in Turkey and Thornycroft has similar vehicles under manufacture for use in Libya and Yugoslavia. A winch and "A" frame make the vehicle useful for a wide variety of roles.

F. Perkins Ltd. announces a £285,000 extension plan to enable a major reorganization of the main Peterborough factory to be carried out. This will include three extra bays totaling 80,000 sq ft at the Eastfield factory and the plan is linked with a development scheme involving additional plant, equipment and handling facilities. Work will be completed by mid-1960, raising production to 700 engines a day, against a peak figure of 400 in 1959.

Basrah Petroleum Co. has ordered power plant worth over £400,000 from *Associated Electrical Industries Export Ltd.* for its new deep sea terminal in the Arabian Gulf. The order covers three gas turbine-generator sets, each of 2,250 kw nominal rating, and comprising an L.21 axial-flow gas turbine driving an ac generator through single reduction gearing. Similar sets, of various ratings up to 4,000 kw, are being installed by oil companies in Iran and Borneo, while in Venezuela a 1,750 kw unit has completed over 20,000 hours of base load service on natural gas.

New Publications

"Lloyd's Register of Shipping Statistical Tables 1959": A highly detailed collection of 13 tables based on the gross tonnage of the world's merchant fleets (100 tons and upwards) entered in Lloyd's Register Book as printed and published in July. Of particular interest to the oil industry are: (a) oil tanker fleets; (b) size and age of oil tankers; (c) propulsion analysis of world tonnage; and (d) steamships fitted for burning oil fuel. Copies from Lloyd's Register of Shipping, 71 Fenchurch Street, London, E.C. 3.

(*Continued on page 22*)

THIS CHIKSAN MARINE LOADING SYSTEM INCREASES FLOW CAPACITY, REDUCES OPERATING COSTS FOR UNION OIL

What you see in the photo above is a Chiksan Marine Loading System on a new multi-million dollar supertanker terminal at Los Angeles operated by Union Oil Company of California. Designed to speed unloading operations, this Chiksan System has five 12 inch by 52 foot arms, three normally in crude oil and two in bunker oil service.

Each arm is capable of handling 15,000 B/H of refined product and up two 11,000 B/H of crude; a greater capacity than any method previously used by Union Oil.

Translated into faster turn around time, this increased flow capacity coupled with other savings through such factors as improved safety conditions results in significantly lower operating costs for Union Oil.

Plan now to install the Chiksan Marine Loading System at your terminal. For full information and recommendations, contact Chiksan.

100-105 PSI ACROSS THE RAIL is safely handled by the Chiksan all metal arm. In addition, smooth interior diameter reduces turbulence permitting more efficient pumping flow.

CLEAN, COMPACT DESIGN has permitted substantial construction savings in some cases through use of smaller docks to house equipment, and outboard dolphins to handle mooring lines.

#59-47

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CANADIAN NOTES

Canada's Laws Revised

Industry and government are still grappling with problems associated with oil and gas regulations for Canadian north and Arctic regions under a "low cost oil" program aimed at achieving competitive entry into world markets.

Problems still to be resolved are believed to be associated primarily with Minister Alvin Hamilton's insistance on a Crown Reserve System and liberal pooling of information acquired by operators from exploration.

Mr. Hamilton called attention in the course of discussing his plans for low cost oil that CPA once estimated in a formal document that a barrel of oil could be produced in the north for about 70¢ as compared with $1.17 in Alberta. He also announced plans for formation of an Oil and Gas Conservation Board for the North.

New Plant Planned in Alberta

Plans are advancing for construction of a multimillion dollar gas processing and sulfur recovery plant in the Innisfail oil field of Central Alberta, according to H. G. Bagnall, chairman of the Innisfail Operators Committee, and assistant manager of the producing department of Canadian Oil Companies Ltd.

The plant will recover about 8.7 mmcf/d of dry gas, 160 b/d of natural gas liquids and 80 long tons of sulfur daily.

Four major gas plant contractors have been asked to bid on construction of the plant and it is expected that the contract will be let early in 1960. Construction will start after spring breakup and the plant is scheduled to go on stream Nov. 1, 1960.

Canadian Oil Companies has been appointed interim plant operator by the Innisfail Operators' Committee. Principal operators, in addition to Canadian Oil, are The Calgary & Edmonton Corp. Ltd., Canadian Superior Oil of California, Ltd., Imperial Oil Ltd., Security Freehold Petroleum Ltd., and Hudson's Bay Oil and Gas Co. Ltd. Construction costs will be shared by all companies in the field on basis of holding.

BA Port Moody Refinery

A case history of the contractual, engineering and construction decisions made by British American Oil Co., Ltd. and Canadian Kellogg Co., Ltd. resulting in B/A's new Port Moody, B.C., refinery in record time and at low cost is presented in a new issue of "Kelloggram." The brochure traces the month-by-month development of the 20,000 b/sd project in diary, photo and chart form, showing how teamwork from contract to start up achieved two basic objectives: speed and low cost. The Kelloggram may be obtained from The M. W. Kellogg Co., 711 Third Ave., New York, or The Canadian Kellogg Co. Ltd., 33 Bloor St., East, Toronto 5.

Petrofina Gas Finds

Canadian Petrofina Ltd., through its subsidiaries, has made a major gas strike at Wildcat Mills, some sixty miles northwest of Calgary. Two wells have shown an average net pay of 135 ft. in the Mississippian limestone at 10,600 ft. Open flow tests indicate a potential of 27 mmcf/d and recoverable reserves appear in the order of 40 billion cubic ft. per section. This particular project is being developed on a 50-50 basis with another major oil company.

A significant extension to the East Calgary Mississippian Gas Field has recently been made which appears to increase the recoverable reserves of the field by approximately 20% to 25%.

Husky Acquires US Firm

Canadian Husky Oil Ltd. will offer to acquire all of the outstanding common stock of Husky Oil Co. of Cody, Wyoming, according to Glenn E. Nielson, president of both companies. Canadian Husky will, with the approval of its shareholders, exchange nine Canadian Husky common shares for each ten shares of Husky Oil Co. common stock. Canadian Husky does not plan to acquire the outstanding preferred stock of Husky Oil.

Venezuelan Oil at Ft. William

Venezuelan oil moved into the heartland of Canada when a tanker unloaded 55,000 barrels at Fort William in the upper Great Lakes. The oil was for the refinery of Husky Oil & Refining Ltd., and marked the first time a tanker with Venezuelan oil supplies had gotten so far inland. The refinery had formerly been supplied by tank car from Saskatchewan. It is not on the Interprovincial line.

Gas Export Permits Move

The Alberta Oil and Gas Conservation Board has concluded hearings on an application by Westcoast Transmission Co. Ltd., to increase from 800 billion cubic ft. to 1.1 trillion cubic ft. the amount of gas authorized for export to markets chiefly in the U.S. Pacific Northwest. Other applications having been made by Alberta and Southern Gas Co. Ltd., and Trans-Canada Pipe Lines Ltd. Additional volumes sought by the three companies amount to a total 2,935 trillion cubic ft.

80,000 Short of Borden Goal

A gap of only 80,000 b/d remains to be filled between indicated normal demand growth for Canadian crude oil in 1960 and the 700,000 b/d target set by Borden Royal Commission second report, according to W. M. V. Ash, president of Shell Oil of Canada. Mr. Ash urged export market development to bridge the gap.

Canada-US Gasoline

At best, it will be May, 1960, before the start of construction on the project of Midwestern Gas Transmisison to bring Canadian gas to the U.S. midwest. This is the official estimate of the U.S. Federal Power Commission in its opinion giving a conditional go ahead to this and related gas expansion projects.

Involved in the overall deal are construction to cost about $118 million and the movement of 204,000 and daily of gas from Canada to the U.S. However, conditions laid down by the FPC raise some question as to whether the project actually will be constructed at all.

For one thing, the FPC approval is conditioned upon approvals by Alberta and the Canadian government of the export of the gas for the project and of construction of $32 million worth of gas pipeline facilities by Trans-Canada Pipe Lines, Ltd., the supplier in the project. While the FPC sees signs that the Canadian approvals will be forthcoming in a reasonable time, others see the rise of a drive in Canada to keep the gas at home.

For another thing, the FPC said its approval is conditional upon Midwestern coming forth with financing proposals that it can agree to. The FPC left open the rate of return to be allowed to Midwestern, after company officials complained that they needed more than the 6.25% which the FPC was about to insist upon.

Thirdly, the FPC go ahead had other conditions relating to firming up of contracts by some of the customers for the gas and for approvals as needed by officials of states of the U.S. for construction and service. The FPC approval, however, does represent the furthest advance in years of efforts to move Canadian gas to the U.S. Midwest. Exactly one year earlier, the FPC had turned down a series of projects to bring Canadian gas to the U.S. as lacking in some essential feature.

Steel Plant Expansion

Interprovincial Steel Corp. has announced in Regina a $1,300,000 expansion program to keep pace with plans for stepped-up production of gas trunk and transmission lines.

Crude Outlook

Total market for Canadian crude will probably increase an average over 7% a year for long term, counting normal domestic growth plus export market expansion, forecast E. D. Brockett, president of British American. Thus total production should double every 10 years, resulting in over 2,000,000 b/d by 1979.

Lookout Butte Gas

Testing at the British American Lookout Butte 11-31 Mississippian deep gas discovery in southern Alberta showed 6 mmcf/d flow rate, with 118 barrels of condensate per mmcf. Six miles south of the Pincher Creek gas field, also owned by B-A, the new strike is considered highly significant, possibly an extension of the field.

Nova Scotia Well

Imperial Oil Ltd. has spudded its first wildcat on Cape Breton Island, Nova Scotia, Imperial Mabou No. 1. It is the first Nova Scotia wildcat for Imperial since the early 1930's and the tenth in the current exploratory program which Imperial started in the Maritime Provinces in 1956. The previous nine wells have all been dry holes.

Northern Policy

Strong criticism of Dominion Government and oil industry push into remote Arctic regions for exploration activity was voiced by E. D. Brockett, president of The British American Oil Co. Ltd. It should be long-range program, he said, but if successful too soon might lead to further aggravation of present oversupply.

Personals

V. E. BOHME, formerly Northern District Engineer for the Alberta Oil and Gas Conservation Board in Edmonton, has received appointment as Development Engineer, a post formerly held in Calgary by Frank Manyluk, who recently became a Board member. Succeeding Mr. Bohme is L. A. BELLOWS, formerly assistant Northern District Engineer.

JOHN PEAKE, who served previously with Canada-Cities Service Petroleum Corp., as proration engineer has joined the firm of Mitchell & Associates Ltd., consulting petroleum engineering and geological firm as a senior associate. He will be posted in Edmonton.

W. G. IVENS has been named supervisor of publications, Shell Oil Co. of Canada, Ltd.

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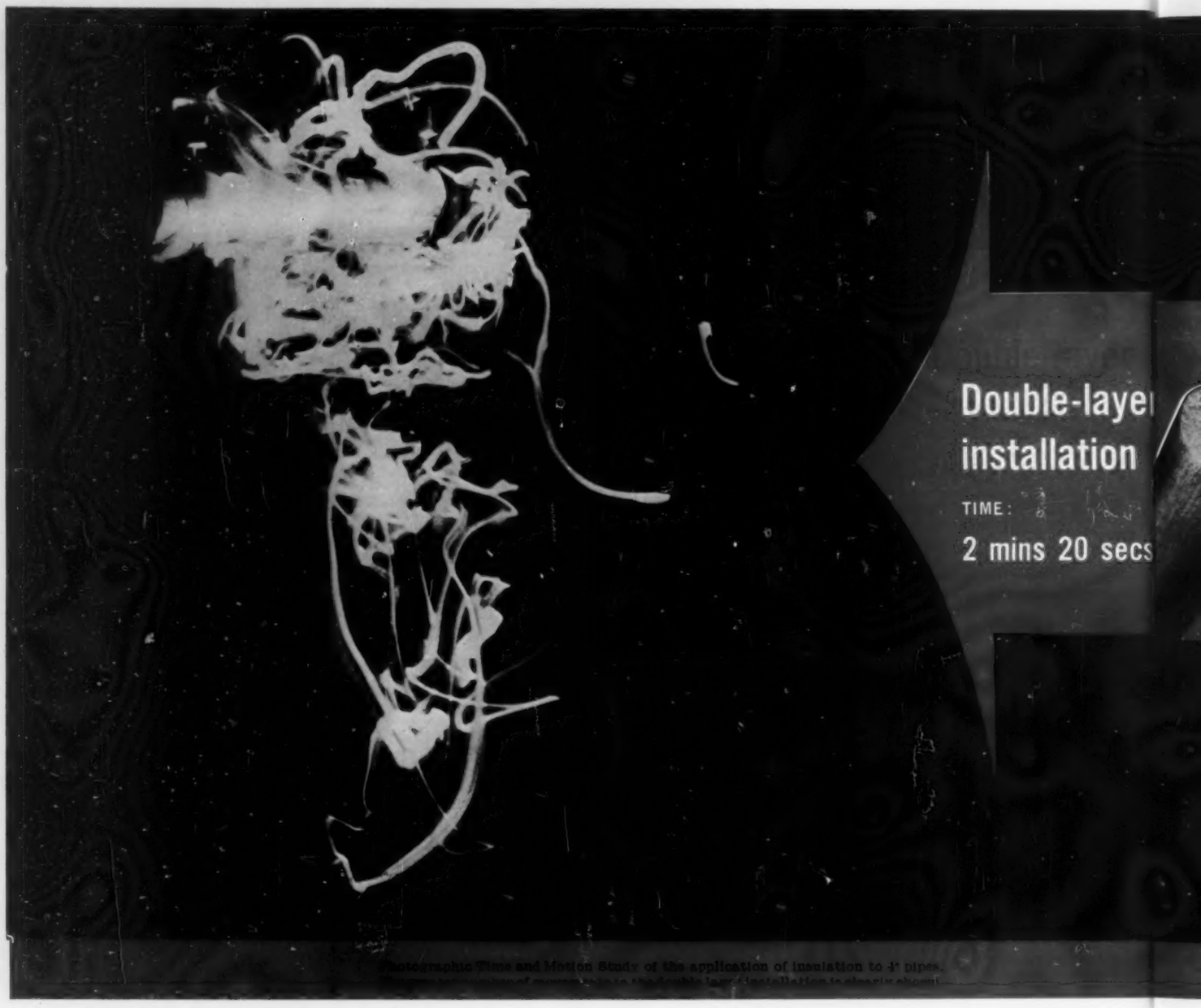


Photographic Time and Motion Study of the application of insulation to 4" pipes.

Avoid the two-layer tangle

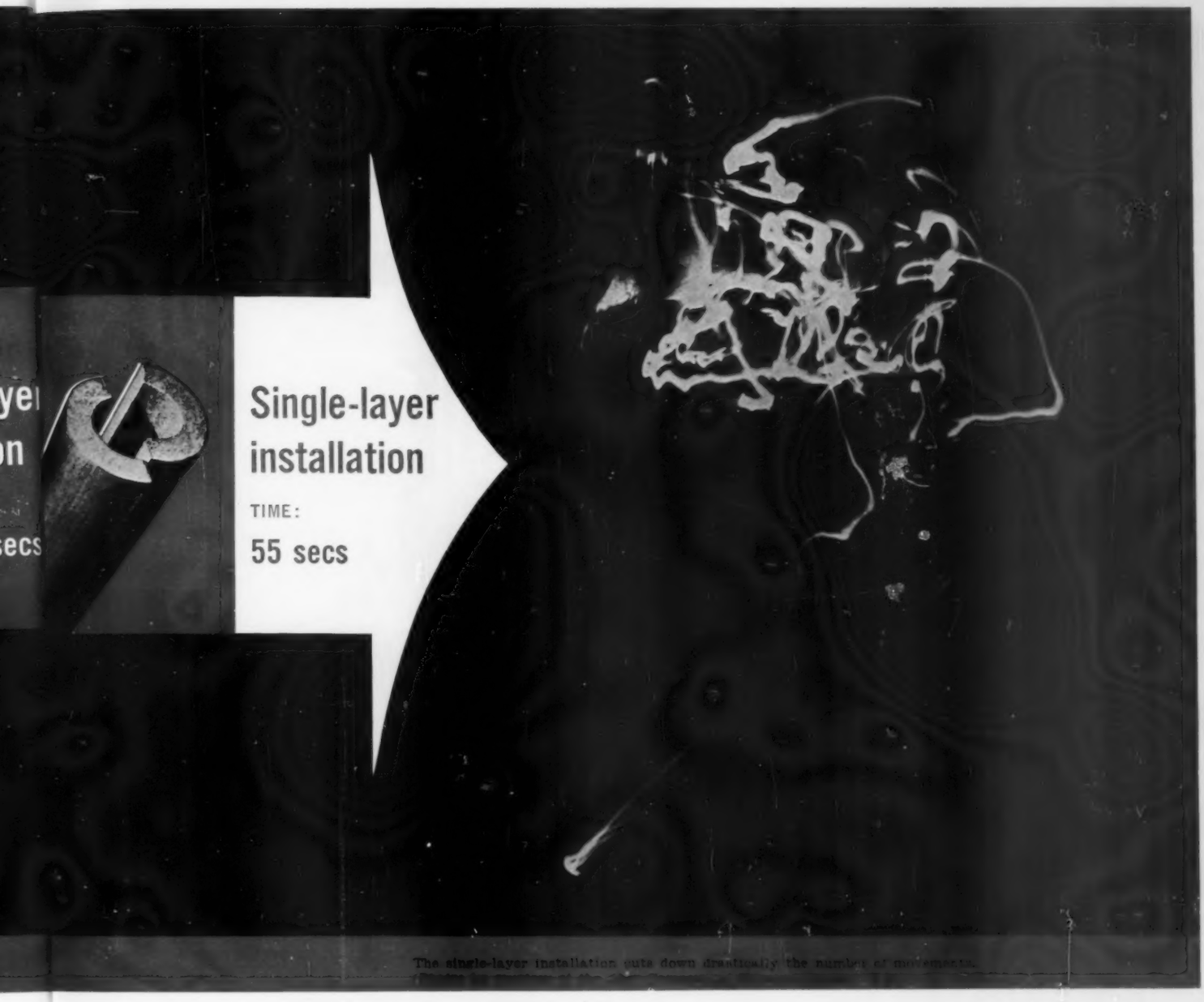
Insulation in a single layer! Caposite was developed by The Cape Asbestos Company to make the compromise of two-layer insulation unnecessary. Caposite does it in one—saving considerably on installation time and costs. Caposite, the amosite asbestos insulation, is designed to withstand temperatures up to 1000°F. without loss of efficiency.

LOW JOINT LOSS

The fibrous edges of Caposite knit together at the joints giving a good heat seal and making staggered joints unnecessary.

EASY TO HANDLE

Its inherent strength makes it possible to handle Caposite in large sections—for example at 2" thick for 30" n.p.s. —with very little damage and a further saving in installation costs.



The single-layer installation cuts down drastically the number of movements.

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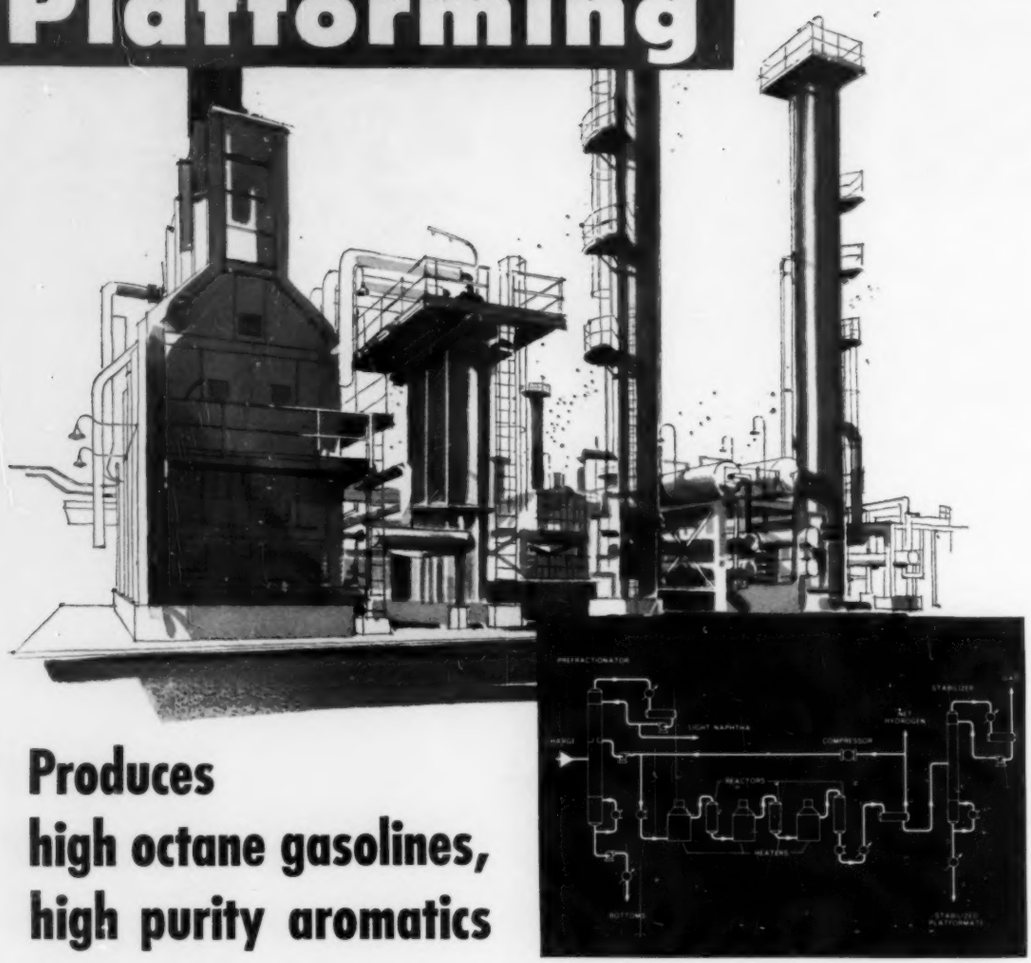

Produces high octane gasolines, high purity aromatics

No longer need low octane gasolines be a serious problem in refinery economics, thanks to the remarkably versatile refinery tool—UOP Platforming.

Inexpensive to install, easy to operate, reliable and safe, Platforming serves an important dual purpose: Using a platinum-containing catalyst which can operate for long periods without serious deactivation,—hence, expensive regeneration equipment is unnecessary—this practical process provides truly continuous production of superior quality motor fuel from straight run naphthas.

Equally important, it enables the refiner to produce in commercial quantities excellent base stocks for aviation gasoline and Platformate for aromatic extraction such as benzene, toluene and xylenes, now in such growing demand for detergents, nylon, plastics, high explosives and many other products.

As shown in the accompanying flow diagram, the Platformer is a compact unit consisting of a reactor section, stabilizer section, and (optional) feed preparation section. It can handle the full boiling range gasolines without prefractionation, or naphtha cuts separated from them, and efficiently processes any naphtha from crude distillation, natural gasoline plants or cracking units.

Platforming is but one of many UOP refining and petrochemical processes for improving refinery efficiency and producing more salable products. Available to refiners everywhere, these processes are illustrated and described in an informative new booklet. Write for your copy today. Address:

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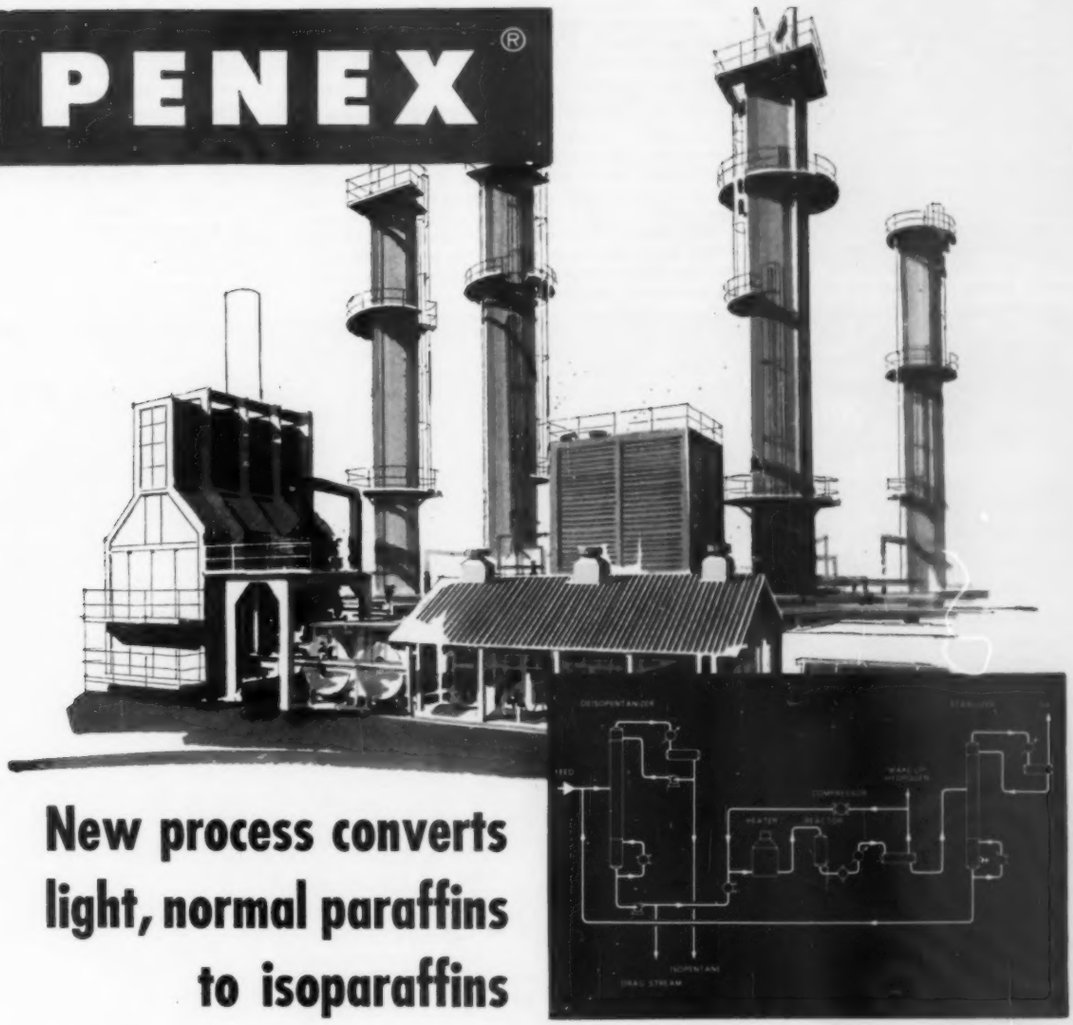
More Than Forty Years Of Leadership In Petroleum Refining Technology

PENEX®



New process converts light, normal paraffins to isoparaffins

Here is a process which for the first time enables the refiner to economically upgrade pentane and hexane fractions, thus producing a high octane product with improved burning qualities, without plug-fouling and pre-ignition, with better sensitivity and better lead susceptibility.

The Penex process is economical in installation, operation and maintenance. Regeneration is not required, thus reducing capital investment, simplifying operation and reducing maintenance. Catalyst and reaction products are non-corrosive so lower cost carbon steel construction can be used.

Penex has an additional advantage when used with a reforming process such as Platforming®. Make-up hydrogen used in Penex processing is derived from the Platforming net high pressure separator gas. Hydrogen is consumed in insignificant quantities. This combination of processes also gives a considerable yield advantage at the same octane number.

Many other UOP processes are available to the refiner who is seeking ways to improve his operating efficiency and manufacture the kind of products that will bring him maximum market and economic benefits. These processes are available to all refiners. They are described in an informative fully illustrated booklet, "UOP Processes and Products," which will be furnished on request. Write for your copy today. Address:

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VENEZUELA

The National Oil Company

The Venezuelan government recently announced the formation of a commission which will study the formation of the long awaited national oil company, described as "the realization of one of the fondest dreams of the Venezuelan people who have been asking for direct participation in the oil industry since the very beginning 42 years ago."

Minister of Mines and Hydrocarbons Dr. Juan Pablo Perez Alfonzo addressing congress last May stated: "The creation of a National Oil Company and of a tanker fleet, is the general aspiration of the Venezuelan people which has long been unsatisfied. By 1948, the government had appointed a commission to study the best way to form the company. More than ten years have elapsed (dictatorship) and now everyone recognizes that the need has grown for the creation of a company to engage in all aspects of the oil industry in order to serve as basis for contrast with the private companies which administer and exploit a great part of the national oil wealth.

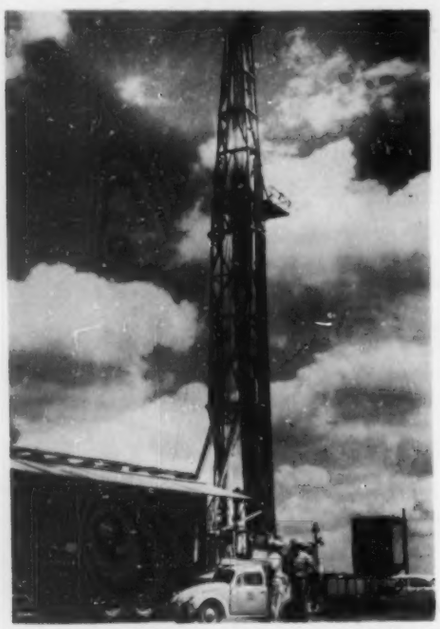
AVERAGE PRICES ON VENEZUELEAN AND AMERICAN OIL
(Dollars per Barrel)

Year	Venezuela	US	Difference
1950	2.34	2.51	—0.17
1951	2.40	2.53	—0.13
1952	2.41	2.53	—0.12
1953	2.43	2.68	—0.25
1954	2.64	2.78	—0.14
1955	2.66	2.77	—0.11
1956	2.54	2.79	—0.25
1957	2.51	3.10	—0.59
1958	2.57	3.08	—0.51

"Without interfering with the normal activities of the private oil industry which the country is interested in maintaining in a full state of development, it is also important to create the national company that we have wanted so much. As it is only natural, the government's position responds to public opinion in the country, and if the company has not yet been formed it is because in the short time that the constitutional government has been in existence, pending problems and matter requiring immediate solution, have consumed all the available time.

"We must not and do not want to act hastily in a project of such importance. We are also planning the formation of a national tanker fleet which may or may not be directly related to the National Oil Company, but in any case, its creation will have to follow the formation of the latter."

The minister has said that the company will begin as a small operation in one of the proven national reserves, probably as a contracted operation until more experience is acquired. The national company will not have to pay for the concession, but will pay taxes and operate under the same laws and regulations as the foreign companies in order that the operations can be compared to determine whether it can be economically successful or not. The formation of the company was announced for "before the end of the year."



Mene Grande Oil Co.'s Rig 31 has set what is believed to be a new world's record for total footage drilled during an eight-hour day at El Tigre, Venezuela. The General Electric-equipped electric-drive system on the rig, which is the first trailer mounted unit in Venezuela, pushed the bit down 3,459 ft in eight hours to break the 2,803 foot mark set in Texas last year.

National Energy Council

On Sept. 11, 1959, the National Council of Energy was created by presidential decree. Main purposes of this council are to act as a consultant body to the executive government on all matters pertaining to the production, distribution and consumption of energy.

Even though Venezuela has a large hydraulic potential source of energy, it is still in its primary stage, thus the Energy Council will be mostly concerned with oil and natural gas energy.

At present there is a large gas pipeline system being constructed by the government to supply gas to a growing local industry, and the formation of a National Oil company has been announced for the near future. Growing energy needs of industry and domestic consumption in the cities will be part of the programs to be studied by the new council.

Crude Production

Crude oil production in Venezuela this year is running 9.6% ahead of that a year ago. In the first eight months of 1959, it came to 2,783,900 b/d average, as against 2,539,500 b/d in the first eight months of last year. In all of 1958, production averaged 2,604,500 b/d against 2,779,300 b/d in 1957, and 2,456,800 b/d in 1956.

Production by individual companies follows: Creole this year has averaged 1,135,300 b/d up 8.2% from the first eight months a year ago. Production by Mene Grande dropped 6.1% to 363,300 b/d; by Mobil 13.6% to 110,200 b/d; by Petmer 5.3% to 31,800 b/d; by Richmond 34.4% to 51,000 b/d; by Texaco 7.9% to 54,800 b/d, by Varco 9.8% to 25,700 b/d; by Sinclair 22.3% to 48,000 b/d; by Talon 12.5% to 1,400 b/d; by Coro 100% to zero; by Pan Venezuelan by 100% to zero; and by Continental 100% to zero.

Phillips increased its output in the first eight months of this year by 44.2% to 17,300 b/d; Superior increased 21.1% to 18,400 b/d; Ven-Sun increased by 358.6% to 32,100 b/d; San Jacinto by 567.4% to 30,700 b/d; and Signal by 24.4% to 24,500 b/d.

Refineries in Venezuela had a total crude throughput of 196,083,157 bbls in the first eight months of this year, including product intake for blending. Fuel oil production was 110,635,177 bbls and gas oil and diesel oil output was 35,419,651 bbl.

Venezuelan Discovery

A new producing area in the Aguasay region of the State of Monagas, eastern Venezuela, has been opened with the completion of a successful dual-zone wildcat by Sinclair Venezuelan Oil Co. The new well, known as East Aguasay No. 2, was completed in two zones, one at 14,183 ft, the other at 14,264 ft, for a total of 1,352 b/d of about 30 gravity crude oil, according to the company's announcement.

Significance of the new well lies in its location, Sinclair said. The new producer is 3 miles east of Aguasay No. 1, Sinclair's discovery well, which is 8 miles east of the established Aguasay field. The new well proves, in the Company's opinion, a major continuation of the producing trend, which now extends over 10 miles of Sinclair concessions. The new well also is of significance to nearby acreage held by others. Sinclair Venezuelan Oil Co. holds 12,500 acres in the specific concession on which the well was drilled.

Cia. Shell Backs Government Bills

Compania Shell de Venezuela in Caracas, Venezuela, has announced it will participate in an arrangement concerning the issue of Venezuelan Treasury bills, where such bills will be taken up by certain New York banks which will buy them through the agency of the Central Bank of Venezuela paying for them in dollars. The company said: "Compania Shell de Venezuela much appreciates the words of the Minister of Hacienda on behalf of the government in announcing the collaboration of the oil companies and takes this opportunity to confirm that its participation in this matter may be regarded as an expression of confidence in the economic future of Venezuela."

Second Venezeulan Supertanker

The supertanker "Esso Caracas" is scheduled to arrive in Venezuela in the latter part of December. This is the second of four sister ships being built for Creole in Japan, of which the first one was delivered two months ago. A complete Venezuelan crew has been sent over to Japan to train during four weeks and bring the ship back. The "Esso Caracas" has a 36,000-ton displacement and will be destined to the traffic between Maracaibo Lake fields and Aruba.

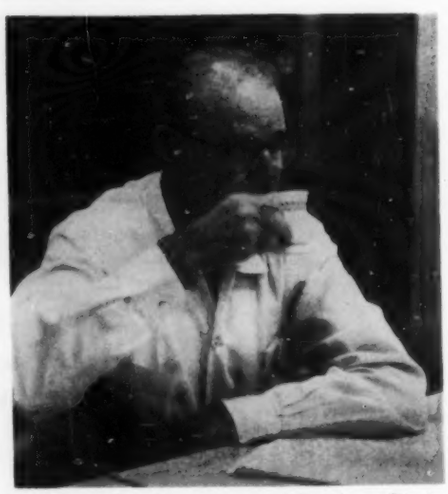
New Tanker Terminal

Shell of Venezuela has completed construction of its $35 million terminal Puerto Mirando on Maracaibo Lake. From this harbor which is one of the largest of Venezuela, crude will be shipped out directly abroad by supertanker, which can now cross the bar at the entrance to Lake Maracaibo. The first shipment was made October 5, when tanker "Galeomma" took a shipment of 50,000 bbls. of crude.

Jesse L. Ford Retires

Jesse L. Ford, manager of Tia Juana District, Creole Petroleum Corp., is retiring after riding the booms for 32 years in Venezuela. He first went to work with Standard of Venezuela (Creole's predecessor) in the old Hombre Pintado field, near present day El Mene Mauroa. Hombre Pintado, Painted Man in Spanish, was named for one of Venezuela's rare examples of Pre-Colombian art, a faint drawing on a cliff located in the area. Standard of Venezuela sold the Hombre Pintado field to B.C.O. (British Controlled Oil Co.) and Ford was transferred to Quiriquire, just as that field in Eastern Venezuela was opened. There was no conventional housing, just a clearing in the jungle, 25 men, but no women. After a year Ford took his first vacation; on July 30, 1930, he was married in New York City.

Ford enjoys recalling how he arrived at the various new fields just at the onset of a boom, watched it rise to a peak, and, always, just as the tapering off began, was sent on to meet the next boom. He rode two Quiriquire booms, the first in 1929 when the field was opened, the second in 1935, after the slack season of 1932-33; the second one built up to 90,000 barrels. The Cumarebo boom, 1932-35, finally reached a peak production of 30,00 b/d of fine, high gravity oil. The biggest and best boom of them all was in Tia Juana, in 1957, when the district was producing 700,000 b/d. His keenest satisfaction, however, has been to watch the development of Venezuela as a whole. When he arrived, the only automobiles were Model Ts.; burrows were the chief means of transportation. Small towns have grown to cities; highways link the nation; industry has arrived. In a way, he has ridden the biggest boom of all—the boom of a nation. Now Ford is returning to Oklahoma City, for a year at least, and will give his only daughter, Michael, in marriage to Jerry Rhoades this fall.



Jesse L. Ford, retiring manager of Tia Juana District, Creole Petroleum Corp., who has ridden the booms through 30 years in the Venezuelan oil fields.

Just the Trick for Drilling Rigs

Wherever there are drilling fields in the world diesels will be found doing their job — many of them Mercedes-Benz diesels.

Why? There are four good reasons: First, the Mercedes-Benz diesel program embraces 24 types with horsepowers ranging from 17 to 3000 h. p. It therefore provides the practical solution to every actual power problem.

Second: Mercedes-Benz diesels — water-cooled, four-stroke designs with pre-combustion chamber, of vertical or horizontal in-line type or V arrangement, supercharged or nonsupercharged — are as powerful, dependable and durable as all Mercedes-Benz products.

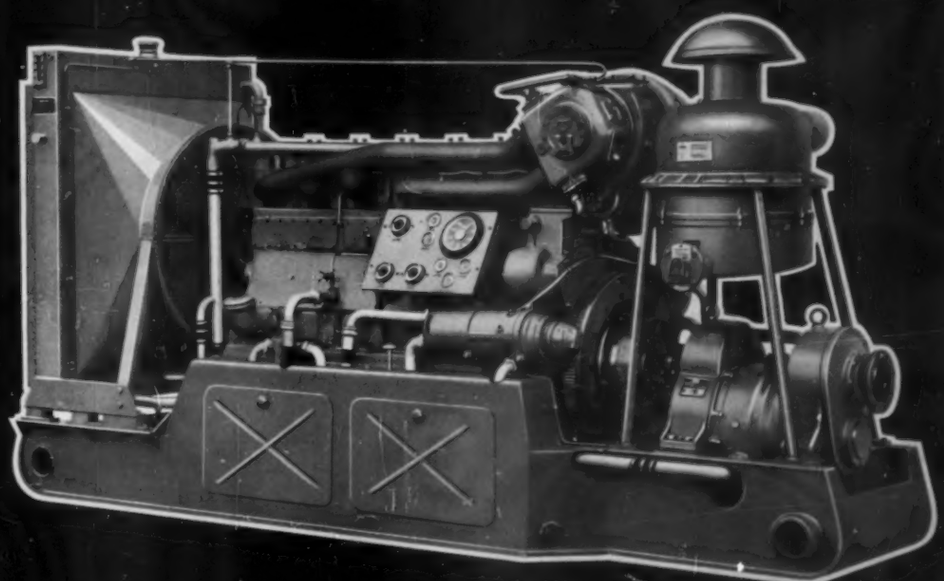
Third: All engines are precisely equipped for the particular drilling job expected of them and conform to international safety regulations.

And fourth: At hundreds of service stations around the globe skilled mechanics are on hand to keep every Mercedes-Benz diesel operating at top performance.

Therefore, Mercedes-Benz diesels offer all the features required for truly economical, reliable operation at the derrick.

Quality Means Dependability

Mercedes-Benz diesels have many attractive qualities: High performance level at negligible fuel cost; their simple, rugged design makes for easy maintenance, and they will keep rendering their efficient services for years on end. However, their most striking advantage is their outstanding quality: this means dependability for every assignment.



974 MA●

MERCEDES-BENZ DIESEL

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Propellers of Heliston design in Stone's Bronze and Novoston alloy are well known in this country and throughout the world and for many years have been accepted as the solution to many of the problems associated with ship propulsion. Stone's Charlton propeller foundries are probably the largest and most specialized of their kind in the world. Production is backed by extensive laboratory facilities. Each propeller, whether large or small, is a high quality casting, formed to close tolerances and finished machined.

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KELLOGG PROCUREMENT

CUTS REFINERY COSTS

WITH LANDING CRAFT

When faced with the problem of getting four huge diesel engines from the United States to Venezuela, and installing them for generating power in a remote coastal refinery, Kellogg minimized man-hours for shipment and installation by chartering a landing craft.

Customary dismantling, crating, and reassembling were avoided; engines were landed almost at the power plant site; the entire job completed within just ten days after the craft had left Newport News, Virginia.

This unique procurement operation, part of Kellogg's complete turn-key responsibility for Mobil Oil Company de Venezuela's new 50,000 BPD refinery at El Palito, is typical of the cost-cutting ingenuity that goes into every phase of Kellogg's coordinated procurement-engineering-construction services for oil companies throughout the world.

Refinery engineers interested in the details of Kellogg's complete assignment at El Palito are invited to send for the current Kelloggram—"Operation Procurement", and a recent folder on the entire project—written in Spanish and English.

Weighing 100 tons each, the first of four diesel engines is hoisted aboard landing craft at Newport News, Virginia.

KELLOGG

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WORLD PROCESSING REVIEW

By Wm. C. Uhl, Processing Editor

Highlights of the month—two new processes, a new gasoline additive, corrosion prevention, and cost reduction on new plant construction and design

With this issue, the editors of WORLD PETROLEUM begin a monthly review of significant developments in petroleum processing world-wide—developments that emphasize the dynamic nature of the industry, developments which will in all probability be merely commonplace and routine matters in the near future. In addition, this monthly review will bring together the many current international news items about refining and petrochemicals.

The five most interesting and potentially significant new developments of the past month include:

1. Two new processes. One of them, a form of catalytic cracking developed by Union Oil Co. of California and named "Unicracking," is aimed at the conversion of low quality distillate fuels into high quality gasoline, jet, and diesel products. The other, a one-step catalytic process for purification and dealkylation of aromatic light oils, trade-named "Litol," was developed by Houdry Process Corp.

These developments were made public very recently, and add to several new processes already announced during the past year including Universal Oil Products' "Merox" (WORLD PETROLEUM, November, 1959, pp. 86-92) and California Research's "Isocracking" (WORLD PETROLEUM, December, 1959, pp. 70-76).

Unicracking produces an olefin-free gasoline, according to Union Oil. It has been in pilot plant stages for about a year and the company is considering a commercial scale operation. Details of the technique were not revealed except the company said it is a form of catalytic cracking, but in contrast with existing processes of this type does not require continuous catalyst regeneration. Union's president, Reese H. Taylor, said, "The process runs for a number of months, followed by a short catalyst regeneration period and then returns to further months of continuous operation."

"In addition to a primary advantage of simplicity," Mr. Taylor said, "other advantages of the process include production of total product in greater volume than the feedstock, flexibility in varying the percentage of gasoline and diesel oil product as may be required by the refiner, and the absence of low value cracked fuel oil as an undesirable by-product."

The Litol process, developed by Houdry in cooperation with a large eastern steel company, is available for general licensing. Although it is believed to be of particular interest to coke oven operators, the technique can be used for the dealkylation of toluene, xylene or higher aromatics from sources other than coke oven light oils to produce high quality benzene or other more valuable aromatics.

The purified benzene obtained contains typically less than one part per million of thiophene and has a freezing point of 5.4 C or higher, Houdry states. Because catalytic dealkylation is an integral part of the process, additional quantities of benzene are realized from toluene and xylene in the aromatic light oil feed. Destruction of aromatics is negligible, resulting in extremely high yield, the company pointed out. The process eliminates the need for a second step which would involve either costly azeotropic distillation or solvent extraction.

2. A new gasoline additive designed for carburetor detergency and icing protection. Called "Centrol S-41-K," the new additive was developed by Central Soya Co., Inc., with contributions in research, field tests, and evaluations made by Standard Oil Co. (Ohio). It is a modified phosphatide made from lecithin, in turn derived from soybeans.

Laboratory and field tests as well as commercial usage since early 1958 have shown the product to provide excellent carburetor detergency and anti-icing, plus mild rust inhibitive properties, according to Central Soya. Other test data have indicated that it does not contribute to intake valve deposits, ORI, surface ignition, spark plug fouling, sludge or varnish formation, or cause any other detrimental side effects.

At a suggested concentration of 50 ppm, the material prevents and gradually removes deposits on the carburetor throat and throttle plate. This level also gives good icing protection for highly volatile gasolines through good synergistic effects with phosphorus additives.

One survey in the midwest, on cars of various makes, models and ages examined at random, indicated that three out of four carburetors had measurable deposits. About 25% of the cars, with mileage totals ranging from 2,000 to 9,000, had deposits which could cause poor performance. Research and commercial experience has shown that the new additive can prevent such deposits.

About 25¢ worth of the product treats enough gasoline for over 2,000 miles of average driving. The material can be used in both regular and premium grade fuels motor.

3. A new corrosion fighting technique developed by Continental Oil Co. and of specific use with materials which are electrolytes. Called the "Anotrol Electronic Process," the technique uses anodic polarization to prevent corrosion by induced passivity in the metal surface. Continental has carried out a year of study at its Baltimore, Md., plant, and found the process works with mild and stainless steel equipment used to handle such materials as sulfuric and phosphoric acids, sodium hydroxide, aluminum sulfate, and ammonium nitrate.

The vessel to be protected is made the anode of an electrical circuit. A platinum electrode of special design to avoid damage by heat and agitation is the cathode. An automatic potential controller supplies electric current to make the metal surface passive. The controller also supplies current continually at a predetermined voltage. A reference electrode (with the platinum electrode common to it) maintains voltage and current. Continental has used saturated calomel and silver chloride reference electrodes.

Two conditions are a requirement for successful anodic protection: the material in the vessel must be a good conductor, and the metal-liquid system must be one that shows passivity or formation of an oxide film on the metal surface.

Electric requirements are said to be relatively low. Operating cost for protecting a tank of 400 sq. ft. of surface comes to under 8 mills per day, based on electricity at 3¢ per kwh and current requirements of 4.3 milliamps per sq. ft.

4. Development by Allis-Chalmers Manufacturing Co. of its fuel cell to the point where an experimental farm tractor powered by a set of 1,000 of the tiny cells was built and demonstrated a pulling power of 3,000 lb., enough to pull a multiple-bottom plow. The company said the "fuel is a mixture of gases—largely propane."

The company told WORLD PETROLEUM that it has as yet nothing definite to report on the cost of the fuel. It was pointed out that the life of the fuel cell is still not known. A laboratory cell has run between 100 and 200 hours over the course of several months. However, this service has been intermittent, and no single operation has extended more than four hours.

Knowledge of the economics of the fuel cell are naturally still limited, Allis-Chalmers researchers pointed out. They stressed that the cell is still definitely experimental because they do not yet have enough data to use the cell in a vehicle that could become a production unit.

5. Substantial reduction in initial cost of new refineries all over the world is being accomplished by modern engineering practice, according to John W. Packie, coordinator of engineering for Esso Research and Engineering Co.

Citing a specific instance, the new Slagen, Norway, refinery, of Aksjeselskapet Norske Esso, Mr. Packie said:

"Yesterday's refinery was composed of a multiplicity of individual units set up for independent, step-wise operation. Today, a 40,000 b/d plant, such as the one at Slagen, has all process facilities and steam plant integrated into a single operating unit. Yet, the process facilities represent only a small portion of the total refinery equipment. Service facilities (off sites) at Slagen are less extensive than normal. In a less modern refinery they would represent up to 67% of the cost of the total refinery. . . . For example, in a model of a small, 10,000 b/d refinery, which we used to make some engineering studies and which led the way to the Slagen design, the process equipment and the utilities were integrated into a single unit. The offsite portion was drastically streamlined. Cost of offsites in this simplified refinery is only about 50% of total cost. Overall savings are more than 35% when compared with a more conventional plant. . ."

What's New in Processing Plants

Phillips Petroleum Co. is boosting catalytic cracking capacity of its Borger, Texas, refinery to 65,000 b/d, by building a new heavy oil catalytic cracking unit of 25,000 b/d, to provide selective cracking of different feedstocks.

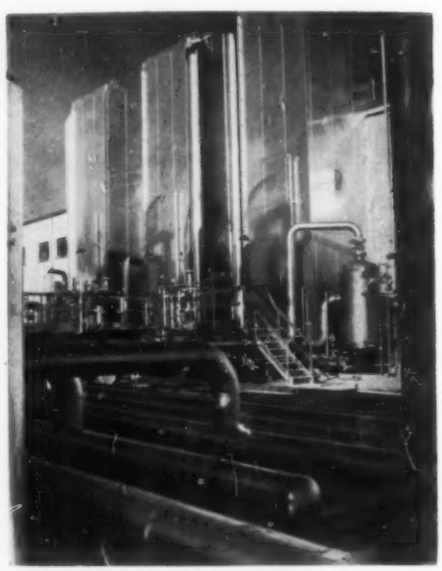
Construction of the unit, by M. W. Kellogg Co., will begin early this year and completion is anticipated early in 1961. Design is by Phillips and Kellogg engineers. The company also will enlarge and improve existing fractionation facilities for both crude distillation and cracking, and will install additional storage and handling facilities.

• • •

Completion of Esso Standard S.A.F.'s new refinery at Bordeaux, France, added 31,500 b/cd to that country's refining capacity and provided the first plant designed and built to operate on French crude oil. Crude flows through a 12-in. pipeline from Esso-REP's Parentis field south of Bordeaux.

Although existing French refineries have expanded greatly in recent years, the new Bordeaux facility is a new plant—the second built in France since World War II—and the Lummus Co. handled the engineering and construction of both. Bordeaux will operate

(*Continued*)



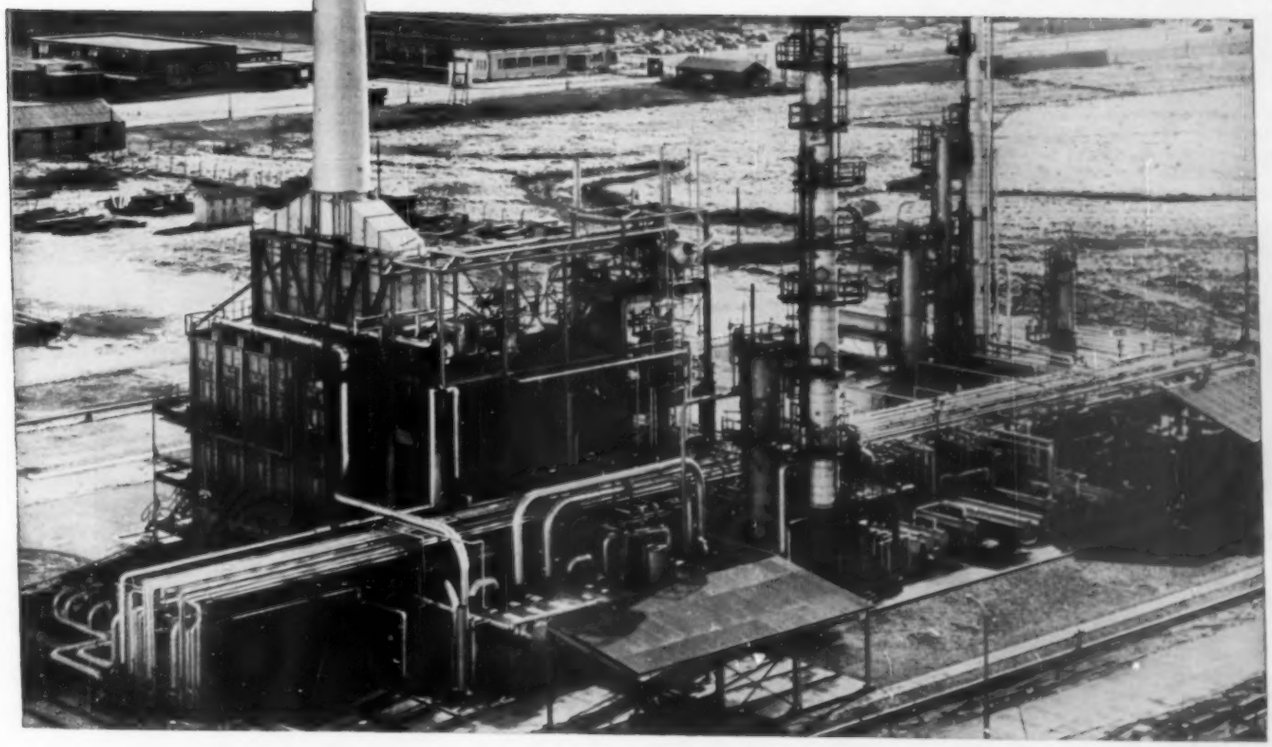
New Helium Plant

Giant new helium-from-natural gas plant at Keyes, Okla., put on stream less than nine months after the contract for its erection was signed, is now the free world's largest helium producer. It processes 70 mmcf/d of natural gas, recovering at least 92% of the helium in the feed. This amounts to an average monthly production of 30 million cu ft of helium, approximately doubling the existing USA output. Fluor Corp Ltd built the facility under prime contract with the US Bureau of Mines. Air Products, Inc., supplied the key low-temperature process equipment for helium recovery. Each of the three tall vertical units in the photograph, "cold boxes," were designed, fabricated and delivered by Air Products within six months after receiving the order.

catalysts in action

SPENCE

Spence COMOX catalyst is used for desulphurisation in oil refineries throughout the world. COMOX is noted for its long life, high activity, selectivity and robustness under the most severe operating conditions. Spence Product Development Department will gladly provide further information on COMOX and other catalysts which are available in commercial and development quantities.



Mobil Refinery, Coryton. Photograph by courtesy of Mobil Oil Co. Ltd.

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at 31,500 b/cd initially; however, it is designed to permit expansion to a 45,800 b/d throughput at minimum cost. The project was handled by Lummus' French company, Societé Francaise des Techniques Lummus.

• • •

Texaco Inc. will add a 4,500 b/d gas oil hydrotreater to its Casper, Wyo. refinery. Contracts for engineering, procurement, and construction have been awarded to Badger Manufacturing Co. Completion is expected in the latter part of this year.

• • •

Ontario's first alkylation unit is under construction at British American Oil's Clarkson refinery, near Toronto, at an estimated cost of $3 million. Procon (Canada) Ltd has the contract and completion is scheduled for this spring. Capable of producing 3,000 b/d of motor alkylate, this will be B-A's second such unit; its first is now in operation at the new refinery completed in 1958 at Port Moody, B.C.

• • •

Ohio Oil Co. will build a 25 million cu. ft. per day natural gas plant near Pulaski, Mich., to serve rapidly developing fields at Scipio, Pulaski, and Albion in south central Michigan. Completion is expected by mid-1960.

• • •

The Goliad Corp., in conjunction with Union Oil of California, has awarded a $4 million contract to Fluor Corp. Ltd. for engineering, purchasing, and construction of a 450 million cu. ft./day natural gasoline plant in Vermillion Parish, Louisiana. Facilities will include absorption, distillation, glycol and sponge oil units as well as refrigeration, power, and steam generation. Construction is planned to start soon.

What's New in Petrochemicals

The first shipment of propylene tetramer late last year by Lion Oil Division of Monsanto Chemical Co. from newly completed facilities at El Dorado, Ark., marked one of the first steps by Lion to supply other Monsanto divisions with petrochemical raw materials from the refinery. The product is being utilized as an intermediate in the manufacture of synthetic detergents in a plant at Monsanto, Ill. The new unit was completed in October, by Procon Inc., and is part of a modernization program begun late in 1957 which included a 5,000 b/d catalytic reformer, 5,000 b/d hydrodesulfurization unit, and 5,000 b/d solvent deasphalting unit.

• • •

Phillips Petroleum Co. and Joanna Western Mills Co. have formed a new jointly owned firm, Phillips-Joanna Co., to produce all types of polyethlyene film. The new company will headquarter in Chicago and a new processing plant is now being completed in Ladd, Ill., to produce linear polyethylene type as well as conventional polyethylene film in low and medium densities.

• • •

Monsanto Chemical Co. plans to increase its production of styrene monomer by at least 200 million lb./yr. The first stage of the new facilities, to be located in Texas, is expected to be in operation the first quarter of 1961. An earlier, 40 million lb. expansion of the styrene monomer facilities at Texas City, Tex., was finished a year ago.

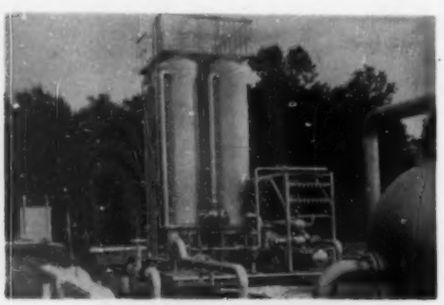
The added production capacity will result in eight expansion projects at Monsanto's styrene polymer facilities at Springfield, Mass., Cincinnati, Ohio, and Long Beach and Santa Clara, Calif. Six of these are scheduled for completion very soon.

• • •

Gulf Oil Corp. has awarded a contract to Badger Manufacturing Co. for engineering and construction of a multi-million dollar iso-octyl alcohol plant at the company's Philadelphia refinery.

• • •

Union Carbide Chemicals Co. has completed facilities to produce more than 10 million lb./yr. of epoxides and other oxygenated chemicals at its Institute, W. Va., plant. Production has not yet reached full capacity but is being increased over the next several months. Among the new products are: 3,4-epoxy-6-methylcyclohexylmethyl-3,4-epoxy-6-methylcyclohexane-carboxylate, vinylcyclohexene dioxide, dicyclopentadiene dioxide, and epoxidized soybean oil. Monsanto also plans to produce epsilon-caprolactone in the unit.



New Packaged Gasoline Plant

A simplified, package-type, processing plant which recovers both natural gasoline and LP-gases from either rich or lean natural gas has been developed by Delta Tank Manufacturing Co., Inc., Baton Rouge, La.

The unit comprises a four-tower, closed regeneration system incorporating fractionation and refrigeration equipment. Absorbent beds of both silica gel and activated carbon are used in the patented unit, tradenamed the "Dryex Gasoline Plant."

Recently completed field tests—conducted over a 14-month period in the Marrs-McLean field in Texas—showed an average daily hydrocarbon recovery rate of 110 bbl from a gas stream flowing at 19 mmcf/d. The closed system makes possible a 60 to 90% recovery efficiency for propane and butane and about 95% for raw gasoline, the Delta firm said. Cost of operation is approximately 15¢/bbl of recovered liquids, consisting of about 8¢ for fuel gas and 7¢ for electricity.

Atlantic Installs Computer

Atlantic Refining Co. will install one of the newest electronic computers at its Philadelphia refinery headquarters next year. The transistorized equipment will provide the company with new levels of data processing power for a variety of purposes—from maintaining control of more than 30,000 material and supply items to mathematically simulating refinery operations for experimentation.

The system, a combination of International Business Machine's 7070 and 1401 data processing machines, will be the first of its kind in an eastern refinery when it goes into operation early in 1961.

New Line of Separators

A complete new line of self-opening centrifugal separators for continuous processing of liquid mixtures with high solids content has been announced by De Laval Separator Co., Poughkeepsie, N. Y. Applicable in petroleum to such operations as purification of heavy crude oil, and lube oils, the line includes three models with capacities ranging from 200 up to 6,000 gal/hr. Specific capacity depends upon the type of feed and solids content involved. The machines are designed for feeds with a maximum specific gravity of 1.5; however, special designs are available for higher specific gravity materials.

Catalytic Construction Names Klopp

Richard P. Klopp, formerly manager of sales, Gulf Coast, has been appointed manager of commercial sales for Catalytic Construction Co., headquartering in Philadelphia. With the company since 1952, Mr. Klopp has previously been a chemical process engineer with Texaco Inc. His assignments with Catalytic have included process and project engineering and project management.

Corrosion Inhibitor Booklet

A new eight-page brochure on Kontol Corrosion Inhibitors for Petroleum Refiners has been issued by Tretolite Co., division of Petrolite Corp. Supplemented with schematic diagrams, detailed engineering drawings and photographs, the application of Kontol inhibitors to various refinery systems is explained and evaluated. Copies may be obtained by writing to Tretolite, 369 Marshall Ave., St. Louis 19, Mo., or 5515 Telegraph Rd., Los Angeles 22, Calif.

Catalyst Publication

"Catalagram," Fall Issue, 1959, a quarterly published by Davison Chemical for catalyst users in petroleum refining and other industries contains articles of interest in the field, including data from a continuous quality survey of equilibrium fluid cracking catalyst for the USA and Canada. W. R. Grace & Co., Davison Chemical Div., Baltimore 3, Md.

London Letter

(*Continued from page 8*)

"Major Developments in Liquid Fuel Firing 1948-1959." The 19 papers by recognized authorities (with discussions) presented at the Institute of Fuel's May 1959 conference on liquid fuel are now available in one volume. This constitutes virtually an up-to-date technical handbook on modern oil firing, and its value is enhanced by its 10-year reviews of progress; these cover liquid fuel utilization in open hearth furnaces, domestic heating, town gas manufacture and gas turbines, as well as in several industries—metal, glass and ceramics. Copies may be obtained from the Institute of Fuel, 18 Devonshire Street, London, W.1, price 42s, plus 1s 9d. postage.

"I.C.I. Titanium (1)—Wrought Products": This is the first of five booklets to be issued within the next few months by Imperial Chemical Industries' metals division which will provide the most information on properties and uses yet published by a British titanium producer. The titles of succeeding parts are: 2—Physical and Mechanical Properties, 3—Corrosion Resistance, 4—Fabrication, and 5—Weight Tables. Copies from ICI, PO Box 216, Birmingham 6.

"The Petroleum Industry": Shell International Petroleum Co. confers great benefit on the oil industry by making the 4th edition of its handbook available to all—and at a price as low as to deserve special commendation. Previous editions were in private circulation only. Compiled by members of the Royal Dutch/Shell group, it has been rewritten or revised to bring it up to date in accord with the ever-changing progress of technology and, in particular, the expansion of petroleum chemicals. Even so, the work remains free of extensive technicalities so that it is admirably suited for all classes of readers. The very many photos in its 680 pages are well chosen and the extensive use of color for the first time in the diagrams is a great advance. There will surely be few to dispute the feeling that this is incomparably the best general textbook on the industry now available. Copies from Shell International Petroleum Co. Ltd., 1 Kingsway, London, W.C.2, price 21s.

Personals

DR. F. E. KING, FRS, formerly a director of British Celanese Ltd., has been appointed scientific adviser to British Petroleum Co.'s refineries and technical department.

E. Roberts

C. M. MERRICK, managing director, has become chairman and managing director of Petrofina (Great Britain) Ltd., and **E. ROBERTS** has been appointed a director. Mr. Roberts has been with Petrofina and its predecessor companies for many years and general sales manager since 1949.

RICHARD WOOD has been appointed Minister of Power in the new government, succeeding Lord Mills, who has been appointed Paymaster-General. Under the previous government, Mr. Wood held posts as parliamentary secretary to the Ministry of Pension and to the Ministry of Labor and National Service.

M. MOTHIO, sales manager of the London division of Shell-Mex and B.P. Ltd., has been appointed manager to succeed G. E. V. Thompson, who has retired. Owing to the rapid expansion of the London petroleum market, there are now two sales managers—**G. V. WATSON** and **T. GLYNN JONES.**

(*Continued on page 70*)

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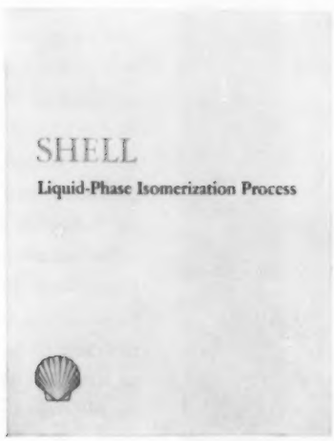

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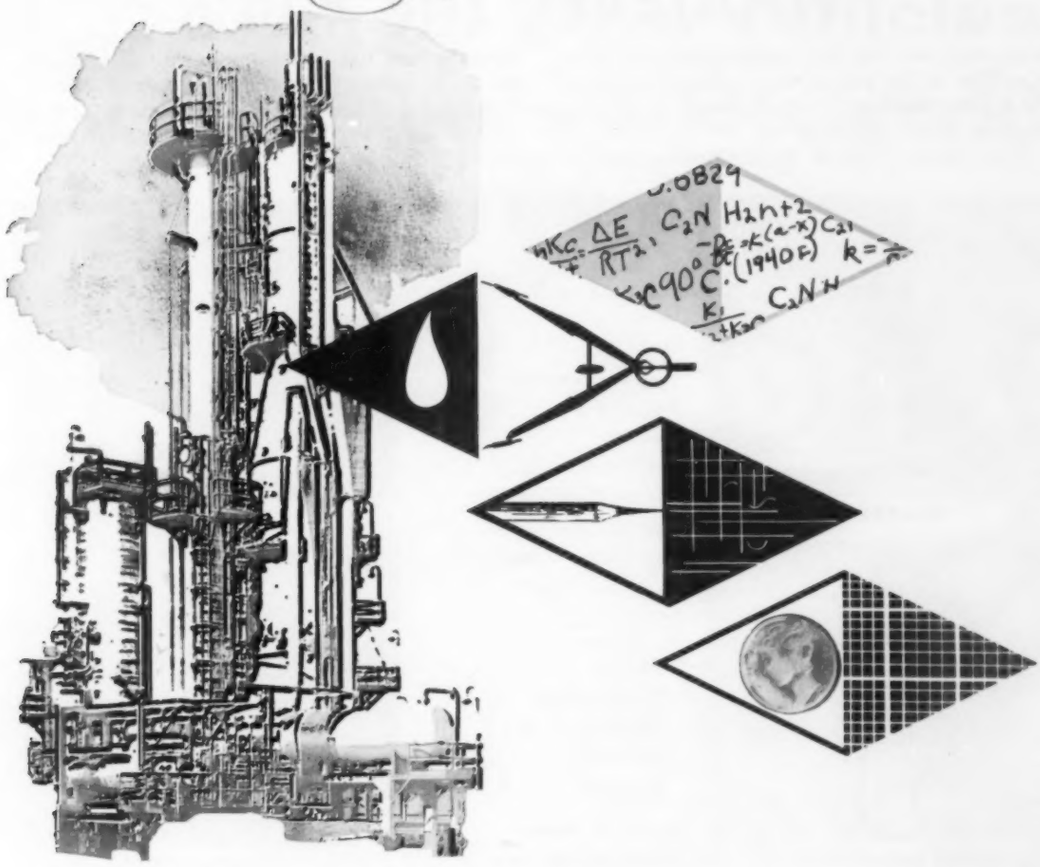

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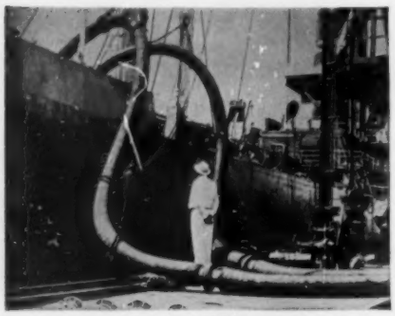

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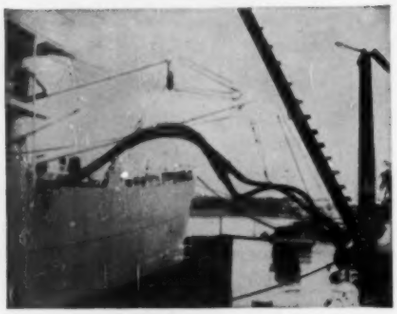
ROTARY DRILLING HOSE



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GREECE—Titan Motor & Tire Trading Co. Ltd., Athens
ICELAND—Egill Vilhjalmsson H. F., Reykjavik
IRELAND—Motors Distributors Ltd., Dublin
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SPAIN—Autotrade, S.A., Madrid
SWEDEN—A. B Scania Vabis, Sodertalje
SWITZERLAND—Fratelli Ambrosoli, Zurich 1
TURKEY—Verdi Ltd. Co., Istanbul
YUGOSLAVIA—"Progres", Belgrade

AFRICA

BELGIAN CONGO—Matermaco-Congo, Leopoldville; Matermaco-Congo, Elisabethville, Socomotor, Bukavu
BRITISH EAST AFRICA—S.A.R.A.G. (E.A.) Ltd., Nairobi Kenya
EGYPT—North East Africa Trading Co., SAE, Cairo
FRENCH CAMEROONS—S.A.R.I., Douala
FRENCH WEST AFRICA—Manutention Africaine, Dakar, Senegal
GHANA—Dizengoff West Africa Limited, Accra
LIBERIA—Claratown Garage, Inc., Monrovia
LIBYA—La Mandataria Ltd., Tripoli
MADAGASCAR—Madagascar-Automobile, Tananarive
MAURITIUS—Robert Le Maire, Ltd., Port Louis
MOROCCO—Soriete d'Importation et de Distribution Automobile, S.O.D.I.A., Casablanca
Marques S. A., Tangier
NIGERIA—Dizengoff West Africa Ltd., Apapa
PORTUGUESE EAST AFRICA—Ronil Limitada, Lourenco Marques
PORTUGUESE WEST AFRICA—Casa Americana Comercial, Luanda, Angola
SOUTHERN RHODESIA—Felix Motors, Pvt., Ltd., Salisbury
Sager's Motors (Pvt.) Ltd., Bulawayo
SOUTHWEST AFRICA—Capital Motors (Pty.), Ltd., Windhoek
SUDAN—Franco-Pinto (Sudan) Ltd., Khartoum
TUNISIA—International Garage, Tunis
UNION OF SOUTH AFRICA—Vanroux Motors Ltd., Johannesburg

MIDDLE AND FAR EAST

ADEN—A. Besse & Company (Aden) Ltd., Aden
AUSTRALIA—Willys Motors (Australia) Pty. Ltd., Sydney New South Wales
BAHREIN ISLANDS—Abdulaziz Algosaibi
BURMA—Setkya Motors, Rangoon
CEYLON—United Motors, Colombo 2
ETHIOPIA—A. Besse & Co. (Ethiopia) Ltd., Addis Ababa
HAWAII—Von Hamm Young Company Ltd., Honolulu 3
HONG KONG—Lien Chen (Hongkong) Ltd.
INDIA—Mahindra & Mahindra Ltd., Bombay
INDONESIA—N.V. Indonesian Service Company Ltd., Djakarta-Kota
IRAN—Sherkate Sahami Jeep, Teheran
ISRAEL—The Middle East Automotive Development Co., Ltd., Haifa
JAPAN—Ryowa Motor Sales Company, Tokyo
JORDAN—Eastern Company, Amman
KOREA—Eisenberg & Company, Inc., Seoul
KUWAIT—Saleh Jamal & Company, Kuwait
LEBANON—Eid Trading Company, Beirut
Eastern Distributors & Forwarders, Beirut
MAYLAYAN FEDERATION—Cycle & Carriage Company (1926), Ltd., Singapore
NEW GUINEA—Colyer Watson (New Guinea) Ltd., Rabaul
NEW ZEALAND—Campbell Motors, Ltd., Auckland
South Island Motors, Ltd., Christchurch, C.I.
PAKISTAN—Eastern Automobiles, Ltd., Karachi 3
PHILIPPINE ISLANDS—Liberty Motors, Inc., Port Area, Manila
PORTUGUESE INDIA—Visnum V. Camotin Tarcar, Nova Goa
PORTUGUESE TIMOR—Sociedade Agricola Patria e Trabalho, Lda., Dili
SAUDI ARABIA—Eastern Distributors & Forwarders, Jeddah
TAHITI—Etablissements Baldwin, Papeete
TAIWAN—Lien Chen Limited, Taipei
THAILAND—Thai Yarnyon Company Limited, Bangkok
VIET NAM—Misetal, S.A., Saigon

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INTERNATIONAL NEWS AND NOTES

Socony Mobil Oil Co.'s discovery well, Amal 1, in the Libyan desert, about 100 miles from the Mediterranean coast. In a preliminary 24-hour production test, the well flowed 865 barrels of 34-gravity oil. The air-filled plastic dome at left is a storage facility for materials affected by the high desert temperatures. The rig is shown here drilling at another site in Libya.

Libyan Discovery

An affiliate of Socony Mobil Oil Co. Inc. in Libya has discovered oil 190 miles southeast of Benghazi. The discovery well, known as Amal 1, is about 100 miles from the Mediterranean coast.

The well flowed 865 barrels of 34-gravity oil in a preliminary 24-hour production test in the interval between 9,841 ft. and 10,405 ft. The discovery well was drilled to a depth of 11,990 ft. and plugged back. It is in Mobil's concession number 12, totaling about 2,000,000 acres.

Aussie Wildcat Stops

Santos, Delhi and Frome Broken Hill have halted drilling at Innamincka No. 1 because of the exceptionally thick sedimentary section of presumed Devonian age, extending from 7,143 ft. The company has transfered the rig north across the South Australian border to Botoota in southwest Queensland.

New Firm In Kenya

The Kenya Oil Co., Ltd., has been formed to retail gasoline, kerosine and diesel fuels throughout Kenya. Organized by Kenyans, the company plans 15 service stations in the next five years, with 100 gasoline pumps and underground storage facilities. In the fourth and fifth year, the company plans a bulk storage depot in Nairobi. Estimated expenditure is 350,000 pounds, about $980,000.

Kenya Oil has a 20-year agreement with Caltex (Africa) Ltd., to buy supplies at competitive prices, and aims to obtain 8% of the Kenya oil market in five years, or about 6.5 million gallons in the fifth year. It estimates Kenya's annual consumption of diesel fuel will rise from 16 million gallons in 1958 to more than 32 million in 1964, due to expanded farm program and secondary industries.

Petrochemicals Down Under

The first full scale manufacture of petrochemicals in Australia will begin at Altona, Victoria, in 1961 at the $5? million four-point complex being established near the Standard-Vacuum Oil Refinery.

The Vacuum Oil Company, Ltd. will establish the key plant in the $52 million complex, a $27 million unit being contracted by Fluor International S.A. and Utah Australia Ltd. To make butadiene from ethylene a $7 million Union Carbide Australia plant will manufacture polythene and another $7 million plant, owned jointly by C.S.R. Chemicals, an Australian company, and Dow International will manufacture styrene. The third unit, the $10 million G R S synthetic rubber plant is to be built by the Australian Synthetic Rubber Company, a recently formed subsidiary of Vacuum, in which Australian rubber companies are participating.

Timor Chooses Next Well Site

Timor Oil Ltd. has chosen the site for its next well, Ossulari No. 1a, about three miles north of Ossulari No. 1 which was recently abandoned. Drilling was expected to start before the end of November. Access roads to the new location are now being constructed preparatory to moving the rig.

Australia's Oil Imports Rise

According to government data, Australia imported 10,879,000 tons of crude and refined petroleum worth $224 million in 1958. Freight charges added another $80 million to the bill.

Local oil refineries processed 9,366,000 tons of the crude oil during 1958. In the previous year Australia imported 10,436,000 tons.

Output in 1958 was nearly three times the 1954-55 figure. Australian refineries in 1958 produced 3,066,000 tons of motor gasoline, 2,665,000 tons of fuel oil, 2,073,000 tons of diesel oil, 254,000 tons of bitumen, and 154,000 tons of aviation turbine spirits. 1,145,000 tons of petroleum products worth $35 million were exported during during 1958.

Aussie Gas Duty To Drop

The Federal government has directed the Tariff Board to decide in 1961 if gasoline should continue to get tariff protection. A tariff on one penny (Australian), approximately one cent U. S. currency, a gallon on imports of refined petrol at present protects the industry.

Gulf-Italia Activity In Sicily

On October 8, 1959, Gulf-Italia produced its four millionth ton of crude from the Ragusa oilfield. The company paid in 1958 more than 4 billion Lire (about 6.5 million dollars) of taxes and royalties to the Sicilian region. During eight years of activity, Gulf-Italia spent in Italy 48 billion Lire in exploration and exploitation of crude, and related activities. In Sicily, 97 wells have been drilled, for an overall depth of 155,000 meters.

New Italian Publication

The association of Italian petroleum industries "Unione Petrolifera" has recently started publication of a monthly sheet entitled "Dati indicativi dell' industria petrolifera italiana." The publication reports, in graphic form, on all activities of the Italian petroleum industry, fills a real gap since Italian statistics have been sometimes scarce, and contradictory. Requests for the publication can be forwarded to Unione Petrolifera, Via Tanaro, 14, Rome.

"Italwarren" In Italy

Warren Petroleum International Co. and Italian "Liquigas S.p.A." have established the "Italwarren S.p.A.". The new concern will purchase from foreign and Italian refineries bulk quantities of LPGas for selling to jobbers operating in Italian market. The Board was elected as follows: Prof. dr. Giordano Dell'Amore, president; dr. ing. Pietro Cavallera, vice president; Willy Bagnoli, Vincent Michael Kelly, Wilson Moody Williams and Walter James Woodger, Jr., directors. Managing director is Prof. Giorgio Roberti.

Italian Synthetic Rubber Exports

In the first nine months of 1959 the plant of Anic in Ravenna exported 17,513 metric tons of synthetic rubber obtained from natural gas and oil. The value of such exports amounts to over 5 billion lire.

Ravenna-Milan Products Pipeline

The Board of Directors of SAROM S.p.A. (Società Anonima Raffineria Oli Minerali) will build a products pipeline linking their Ravenna refinery to Milan. The planned line would have two intermediate outlets at Ferrara and Mantua, and may be laid jointly with a big group (probably Montecatini) interested in petrochemicals. The refinery of Ravenna has a legal capacity of 1,300,000 m. tons per year (26,000 b/d) but an application is pending to expand capacity to 2,500,000 tons. Recently the company requested a further expansion to 5 million tons.

Sardinian Oil Law

The Regional Council of Sardinia has approved the bill concerning the oil exploration and exploitation in Sardinia. The new law is not very encouraging since it is similar to the national law covering the mainland. It presents only two innovations. First, a preliminary survey may be made before application for an exploration permit; secondly, if oil production of the island should exceed two million tons yearly (40,000 b/d), the regional department of industry can request the holders of exploitation concession to set up a local refinery.

New Chemical Plant For Australia

Auburn Council in Sydney's western suburbs is considering a proposal to build a chemical factory worth about $8 million by Australian Petrochemicals Proprietary Ltd. at Silverwater. The company, a subsidiary of Monsanto Chemical Co., St. Louis, proposes to produce styrene monomer, which is not now produced in Australia. The plant would cover 15 acres and employ 70 people.

ENI Agreement In Romania

Agreement has been reached between the Italian state-owned petroleum company, ENI, and the Romanian petroleum industry for exchange of technical and scientific information in the petroleum and chemical industries. Raffaele Girotti, deputy director of ENI, declared that there are "great possibilities between ENI and the Romanian industry in the field of technical and scientific cooperation." Girotti and his delegation also discussed the possibility of exporting industrial plants to Romania and of increasing the trade volume between both countries. The discussions are to be continued.

Pipelines Completed In The USSR

Three major pipelines have been completed in the Soviet Union: the 828-mile-long Tuymasy-Omsk section of the 2,319-mile-long Tuymasy-Irkutsk oil pipeline, which will be the USSR's longest; the 26-mile-long Krasnoyarsk-Perm pipeline, supplying the Perm

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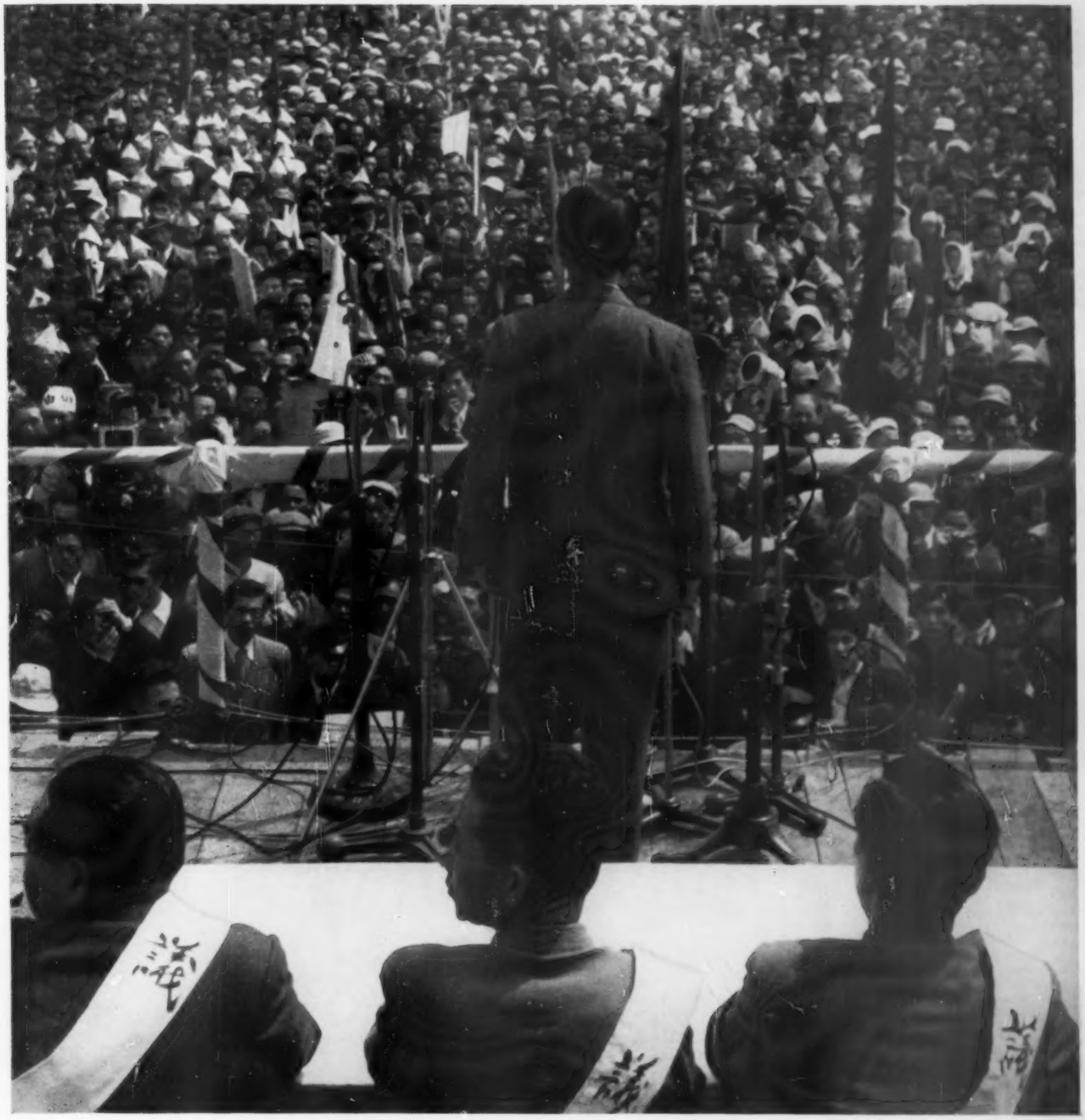

"The time when we could attend to our local affairs without reference to international events is long past. Such upheavals as the revolution in technology, the explosion of population, the awakening of Asia and Africa, will gather pace and power. The question is: are we capable of adapting ourselves to them? Here is the real contest between Communism and our own system. Which will be most responsive to the inexorable demands of the world as it is and as it will be?" – Eugene Holman, Chairman of the Board

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refinery with crude from fields near Krasnoyarsk; and the Shebelinka-Byelgorod-Kursk-Bryansk-Moscow gas pipeline, supplying the capital with gas from the rich fields in the Ukraine.

In the Ukraine some 310 miles of gas trunk lines have been completed in 1959 supplying such cities as Stalino, Makeyevka, Alchevsk, Krasnodom and Zmivey.

Rockwell Expands In West Germany

Rockwell Manufacturing Co. will bulid a new 150,000-square-foot addition to its plant at Pinn-berg, West Germany, for the manfacture of liquid meters, valves and woodworking power tools for the European and world markets. An extensive market research program in Germany and other European countries over the past two years has indicated an immediate volume market there for several categories of Rockwell products not yet produced in Rockwell's West Germany plants.

Lane-Wells Has New Service

An entirely new approach to directional perforating for multiple string, tubingless completions has been announced by Lane-Wells Co., a division of Dresser Industries, Inc. The service utilizes a new combination tool to locate collars, position the perforator in the zone of interest, orient the gun away from the other strings of casing, and perforate the desired zone all on one string of casing.

No radioactive substances are injected or mechanical device placed in any other casing strings. The other strings are not disturbed in any way and can be kept on production, if desired, during the entire operation.

Oil Tax In Sicily

The finance department of the Regional Government of Sicily has stated that in the fiscal year 1958-59 Agip Mineraria, ENI's exploration subsidiary declared for the Gela oilfield production a "ridiculous" income of only 16,348,800 Lire with a corresponding income tax of about 1.5 million (less than $2,500). On the other hand, Gulf Italia in the same year paid the Sicilian Region income taxes of about 1 billion lire.

French Explore In Sicily

The French company "Petropar" recently signed an agreement with "Societá Idrocarburi Trapanese—SIT" a subsidiary of "Ausonia Mineraria Co.," the exploring company of the electrical Italian group "Edison." The agreement is for joint activity covering exploration and exploitation in the west areas of Sicily. "SIT" presently has two exploration permits, one 46,801 hectares and the other 18,784.

Argentine Gasoline Sales Down

Gasoline sales in Argentina slumped 20% in the first half of 1959 compared with the same period a year ago, 6,219,000 bbls against 7,730,000. A rise of 200% in the price at the start of this year is given as the reason.

As a result, Argentina has surplus stocks of gasoline, which are creating a storage problem. About 100,000 bbls/month of gasoline is expected to be exported under an executive decree authorizing YPF to export gasoline and to establish sales prices based on fob prices in the world market. Overall consumption of oil products in Argentina appears to be down about 4% from the first half of last year.

Oil Expansion In Australia

The oil industry plans to spend $140 million on development projects in Australia in the next two years, in addition to expenditure on marketing and the search for oil.

New projects to be undertaken in the next two years include: Expansion and construction of petrochemical industries at Geelong and Altona in Victoria, and at Clyde in N.S.W.; Construction of a 32,000 ton oil tanker at Whyalla, S.A., at a cost of $7 million; and construction of a $40 million oil refinery at Hallett's Cove, S.A., and extensions to cost $30 million at Kurnell refinery, N.S.W.

The total investment in the oil industry in Australia is now nearly $700 million. Of this $120 millon is invested in oil exploration in Australia and the Territories, $300 million in refineries and $250 million in marketing, with sundries at $30 million. Taxation in petroleum products collected by the Federal Government in 1958 amounted to $120 million.

Oil Discovery In Taiwan

Taiwan's first sizeable oil discovery since the end of World War II, Chinsui well No. 38 of Chinese Petroleum Corp. in Taiwan (Formosa) has been on formation test for deeper sands since Nov. 11, 1959. The well flowed 3,500,000 cu. ft. of gas and 65 bbls. of API 44° oil a day average for the first 3 days.

Well No. 38 was selected as a deep zone test well after 12 years of production from shallow zones. The hole was deepened from 11,753 ft. to 13,327 ft. in July, 1959. This is the deepest well in Taiwan.

Africa Concessions Let

Continental Oil Co. and Cities Service Co. will explore more than 10,000,000 acres in Senegal and Mauritania, West Africa.

In Senegal, Conoco and Cities Service will join two French companies, Societe Africaine des Petroles (SAP) and Compagnie de Participations, de Recherches et d'Exploitations Petrolieres (Coparex), in exploring for oil in the St. Louis and Richard Toll areas on concessions totaling more than 3,400,000 acres.

In Mauritania, Conoco and Cities Service will be associated with SAP and the Societe de Recherches et d'Exploitation de Petrole (Eurafrep) on a concession covering approximately 7,300,000 acres.

In Senegal, Conoco will own a 25% interest in the concessions, Cities Service, 24%, and the French companies, 51%. In Mauritania, Cities Service will own a 25% interest, Conoco, 24%, and the French companies, 51%.

New Pipeline In Italy

The "Sarom" refinery near Ravenna will be connected to Milan by a products pipeline. Capacity will be about one million metric tons/year; products to be handled include: premium and regular gasoline, jetfuel, kerosene, and diesel fuel.

Near Milan an adequate storage capacity for products will be provided. The pipe will also serve the Ferrara and Mantua areas, where petrochemical factories will be supplied of their main raw materials. Sarom plans to start pipeline operations within 18 months.

Belgian Underground Storage

Esso Belgium has reported that Distrigas, a Brussels gas company, expects to have underground storage for 20,000 tons of liquid gas completed by the end of this year near Antwerp, Belgium. Three or four other storage areas of the same capacity are planned. The storage is to receive refinery, propane and butane, but could hold methane gas brought by tanker or other gas brought by pipeline to Antwerp from America, France or the Sahara.

Boosts Olefin Capacity

At the Ferrara works of Montecatini a new plant for ethylene and propylene manufacture from steam cracking of Middle East crude fractions started production in October. The plant, the second olefin producer at Ferrara, designed by Kellogg, has a capacity of 30,000 tons/year ethylene and 15,000 tons/year propylene. The cracking section is designed to minimize gum formation through a preheat system of the feedstock, which allows to use low-pressure steam in cracking furnaces. Olefins will be used mainly for polymers manufacture.

No Soviet Fuel Shortage

Alexey Kosygin, chairman of the State Planning Committee, told the 3rd session of the Supreme Soviet in October that the Soviet economy will suffer no fuel shortage next year. It will be possible, he said, to supply the home and foreign markets abundantly.

During the first nine months of this year the USSR produced 95.3 million tons of crude, i.e. 14%, or 11.9 million tons, restated, more than in the corresponding period last year. During the same period, gas output was 26.1 billion cubic meters (921.6 billion cubic ft.), 24% more than 1958.

In 1959 the USSR plans to produce 129 million tons of crude, and in 1960 144 million tons; an increase of 15 million tons. The RSFSR will account for 90% of this increase. Gas yield is to rise in 1960 by one third to 53 billion cubic meters (1,871 billion cbft.).

Kosygin reported that the share of crude and gas in the fuel balance of the country is to rise from 35.3% in 1959 to 38.7% in 1960. This will go with a rise in capital investments by 11%. Pipeline mileage for crude, products and gas to be completed next year was given by Kosygin as 3,726 miles. The major event in refining, he said, will be the putting into operation of the first construction state of the Ryazan refinery in 1959.

The speaker noted that the Soviet oil industry had stepped up its crude production by 620,000 b/d (31 million tons) within two years an achievement which took the United States 9 years, he said.

New Italy Petrochem Plant

Montecatini's USA subsidiary, Novamont, has decided to double capacity of its recently announced new polypropylene plant at Neal, W. Va., from 11 million to about 25 million lb/yr. Plant, financed by a $10 million bond issue in USA, is still in designing stages; completion is planned for early 1961.

Montecatini stock has now been listed on five leading stock exchanges in West Germany, the first Italian and fifth foreign firm to have its shares listed for trading in West Germany.

Brazil to Build Oil Equipment

The "Executive Group for the Heavy Engineering Industry (GEIMAPE), recently organized in Brazil, will develop the local manufacture of equipment for oil refineries.

Apart from this official organization, a Brazilian "Association to Develop Basic Industries" (ABDIB) was founded in Sao Paulo by private interests in May 1955, to assist in developing the heavy engineering industry. The Association, which comprises 25 well-known industrialists with a combined capital of 10,500 million cruzeiros, has prepared plans and estimates for the supply of equipment to the Landulpho Alves and Duque de Caxias Refineries, as well as for plant to industrialize bituminous schists. ABDIB estimates that approximately 40% of the equipment required from the Duque de Caxias Refinery and 70% of the equipment for the synthetic rubber factory, to be annexed to the refinery, can be manufactured in Brazil.

"Companhia Brasileira de Equipamentos para Petroleo" (COMBREP) has been organized by the Simonsen group of Sao Paulo in association with Schoeller Bleckmann, of Austria, the latter renowned for its fine steels and as a manufacturer of equipment for oil drilling and production. COMBREP has designed and built 50 production towers for the Renconcavo oil fields in Bahia, using national raw materials, and is increasing the range and volume of production to meet the needs of Petrobras. Seven firms in Brazil are now turning out storage tanks for crude petroleum and refined products.

Argentine Contracts Modified

Contracts between YPF in Argentina and Kerr McGee Oil Industries, Inc., SAIPEM (ENI) of Italy and Southeastern Drilling Co. have been modified to spread the work over four years rather than three. The Kerr McGee contract has been further amended to provide a one year deferral of dollar payments to the contractor rather than six months.

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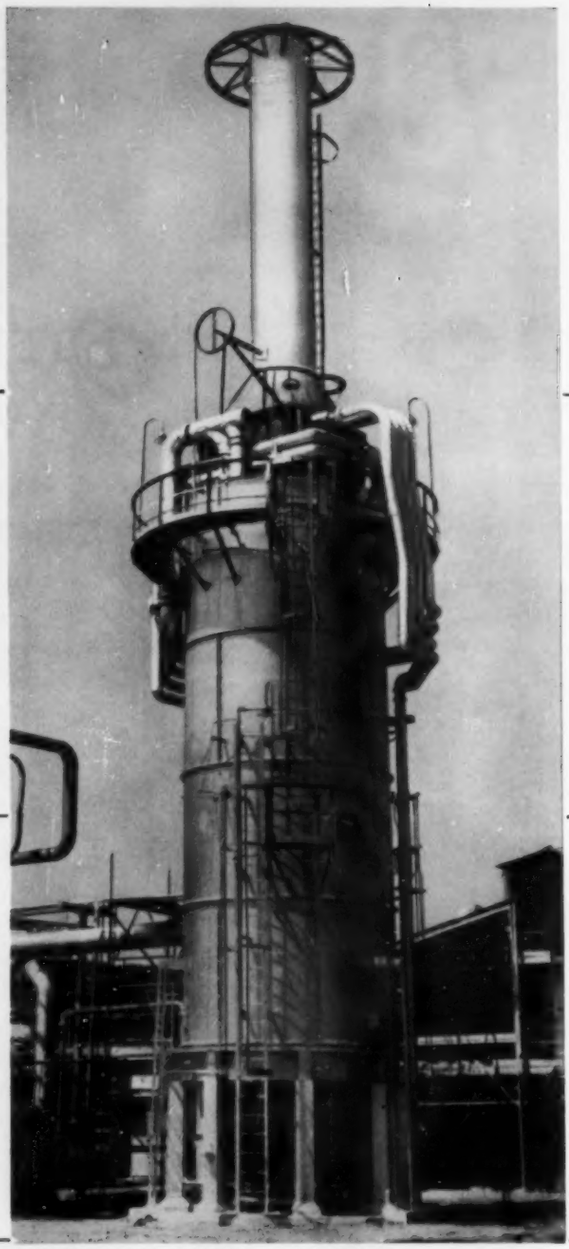

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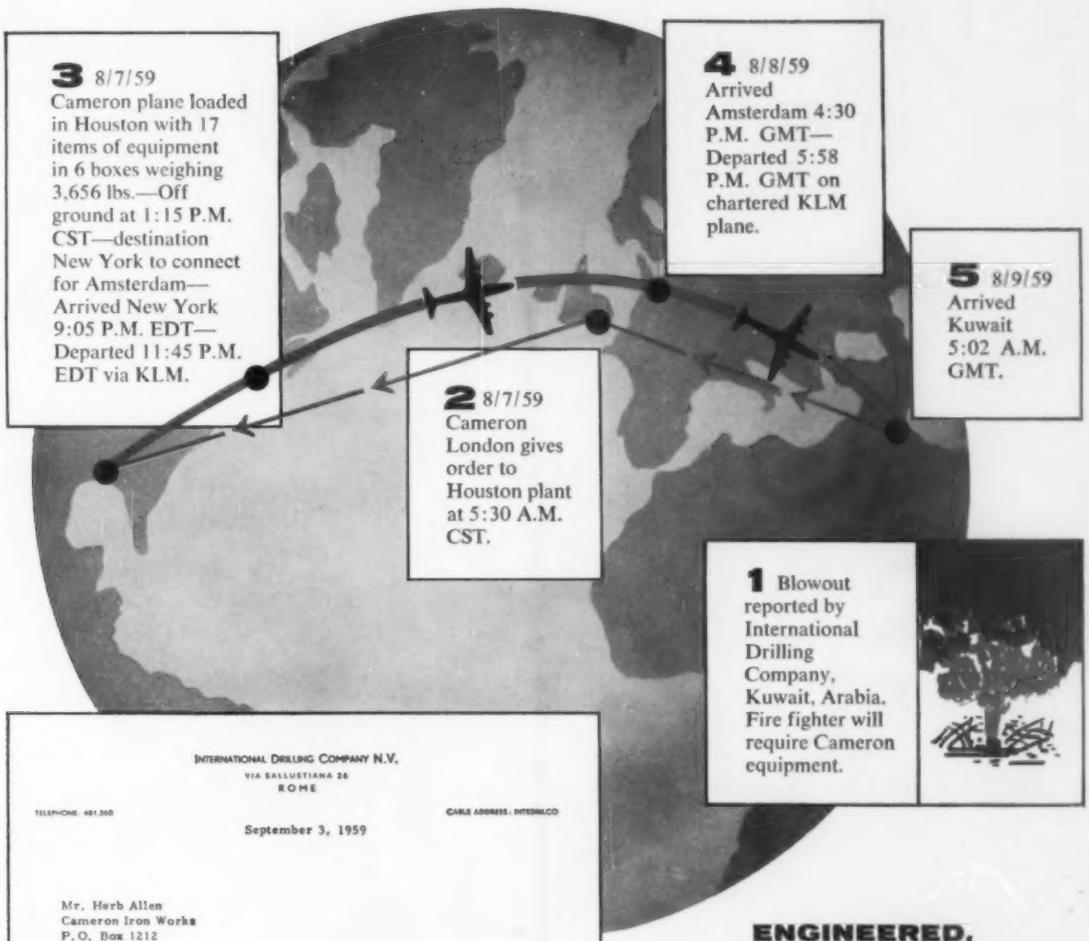
3 8/7/59
Cameron plane loaded in Houston with 17 items of equipment in 6 boxes weighing 3,656 lbs.—Off ground at 1:15 P.M. CST—destination New York to connect for Amsterdam—Arrived New York 9:05 P.M. EDT—Departed 11:45 P.M. EDT via KLM.
4 8/8/59
Arrived Amsterdam 4:30 P.M. GMT—Departed 5:58 P.M. GMT on chartered KLM plane.
5 8/9/59
Arrived Kuwait 5:02 A.M. GMT.
2 8/7/59
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1 Blowout reported by International Drilling Company, Kuwait, Arabia. Fire fighter will require Cameron equipment.

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At 11:50 Friday morning (August 7th) we received word from our organization in the field of the blow-out prevention equipment that they would require from you to attempt to bring the well under control. This material was gotten together, boxed, export papers handled, flown from Houston to New York in your aircraft, from New York to Amsterdam by KLM commercial airliner, and from Amsterdam to Kuwait in a KLM chartered plane and was en route to the location from the Kuwait customs in a total elapsed time of forty hours. You can offer no better service than this.

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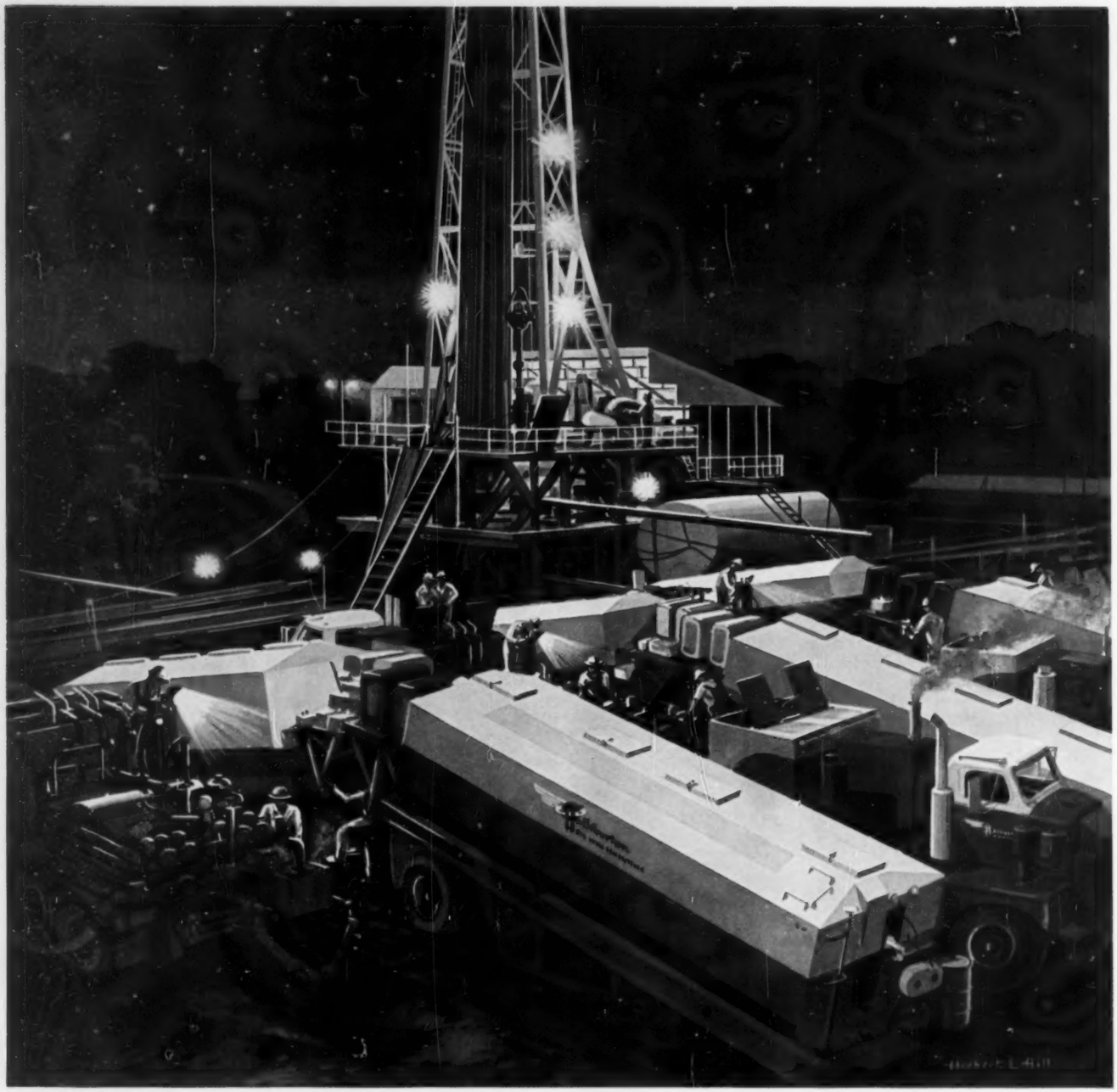

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The petroleum industry starts its second century in an enviable position as far as markets and future growth are concerned. If the industry can solve the problem of living in an era of plenty without drowning itself in hopefully produced inventories it can enjoy a period of unprecedented growth and prosperity. The coal age has passed and the oil age is approaching its zenith. The next challenger—nuclear energy—is still in swaddling clothes. Solar energy is a dream for the distant future.

Outside the field of energy the petroleum industry is making an important place for itself in the field of chemistry. Limited supplies of coal tar have been supplemented by unlimited volumes of raw material for petrochemicals. In the USA almost 80% of current output of organic chemicals is derived from oil. The 12% growth rate is more than double that of the chemical industry as a whole. Similar records are being made in Europe and the industry is spreading to other parts of the globe.

In its first century the United States produced 62,875,000,000 barrels of oil. Rate of growth has exceeded the expansion of the economy because of oil's inroads on coal. For the next few decades it is estimated that the demand curve will be more in line with expansion of energy requirement. Nevertheless USA domestic demand in the next 20 years is expected to total 100 billion barrels. Natural gas probably will enjoy a greater growth than liquid petroleum because its price is held to unreasonably low levels by government edict.

Natural gas has not been a serious competitor in Europe thus far but this situation may change within the next decade. Development of the Lacq field in France will supply very large volumes of energy as lines are extended and additional treating capacity installed. The proposal to bring gas from North Africa to Europe is technically feasible and is fraught with danger to oil.

Coal has not taken the count completely in Europe. Currency conservation is no longer of the utmost importance as the European economy has become more healthy but some governments are finding it desirable to soften the impact of oil on their domestic coal industries. Very large stocks of coal are above ground which are difficult to sell in a free market and unemployment among miners has increased in areas where other industry has not absorbed the available manpower.

Restrictions necessary to alleviate distress in the coal industry are not severe enough to retard greatly the rapid growth in European demand for oil. The rate of rise will not be as steep as it has been during the fabulous fifties but it still should be double that anticipated in the United States. At the recent API session on economics and statistics at Chicago, M. E. Hubbard of British Petroleum Co. estimated that Eastern Hemisphere consumption will rise an average of 7.5% per year in the first half of the new decade. Gasoline demand should rise 6½%, middle distillates 6½% and residuals 9%.

This compares with a recent 13% growth rate and will, of course, discourage some as was pointed out with great good humor by L. F. McCollum, president of Continental Oil Co. in his talk to the annual meeting of the NOMADS at Chicago in November. Mr. McCollom said he was greatly discouraged because most USA companies showed an increase of only 15% in earnings during the first nine months of 1959, whereas he had wanted 25-30%. Domestic demand had risen only 5.5% and he had wanted at least eight.

The economists at Chicago agreed with many observers that inventories will be the most potent force in business during 1960. In the case of durable goods the extended strike of American steel and copper workers assures an active year, assuming the controversy can be settled without another long and disastrous walk-out.

In American petroleum the situation is far different. Our industry has never learned the technique of controlling inventories in a period of plenty such as we have today and will have for some years to come. This stems primarily from the fact that the oil man is at heart an optimist. He firmly believes that his sales force is better than the other fellow's and that he can run full blast and get rid of the finished products without undue difficulty.

The low incremental cost of producing another barrel of gasoline is another potent factor in inventory accumulation. The producer and the refiner alike overlook that the cost of carrying finished goods in storage may well be greater than the reduction in processing cost achieved by greater throughput. Added to this the depressing effect on market prices caused by refinery inventories often proves disastrous to earnings.

Within the past year top management has been attacking vigorously the cost of doing business. Experts from outside have been called in or a do-it-yourself program of pruning and reorganization has been undertaken. At least one firm of advisors has suggested to its clients that they should abandon the idea of requiring that each department make a profit. An over-all profit is the only thing that matters, they say.

This is, of course, rank heresy. Proponents should be burned at the stake. Independents engaged in only one branch of the business always have insisted that integrated companies must be broken up as unfair if they do not make a profit in each operation.

Actually the advisors may not be far from the mark. In an economy of plenty it is not necessary for any segment to build excess stocks to avoid a future shortage. Crude inventories are a good control for production. Refined oil inventories should reflect demand or its lack.

If intermediate management will gauge operations on the basis of inventories at all stages, market prices will be protected. If intermediate management is too shortsighted to do this the top brass should step in.

Collusion between competitors is not necessary. What is necessary is that each manager abandon the view that his sales department can get rid of any quantity which can be produced without regard to competition. With inventories as a guide to production, chaos and distress prices can be avoided. It is possible to prosper in an era of plenty.

World crude output 6.4% higher in 1959

WORLD PRODUCTION of crude petroleum increased 6.4% to 19,300,880 barrels daily in 1959 according to preliminary estimates by the editors of WORLD PETROLEUM. The increase of 1,149,350 b/d is almost three times as great as that attained in the recession year of 1958 when output rose only 3%, most of which was in the USSR.

Again in 1959 the USSR expanded its output at a rapid rate and increased its share of the world supply. Estimate of WORLD PETROLEUM is that USSR crude production rose 264,440 b/d or 11.6% to 2,550,000 b/d. A somewhat smaller output was suggested by Theodore Shabad, specialist on Russian affairs of the foreign news section of the *New York Times* in a paper presented before the American Petroleum Institute at Chicago. His estimate was 2,500,000 b/d for the first nine months of 1959, an increase of 10.6% over 1958. Other countries in the Communist block in Eastern Europe showed little change in output.

Largest volume increase was in the USA where import controls permitted domestic producers to lift 7,050,000 b/d of crude compared with 6,709,150 b/d in 1958. The increase of 340,850 b/d or 5.1% was somewhat less than the 386,400-bbl. rise in total demand for crude and products.

Venezuela maintained its place as the second largest producing nation in 1959 although the USSR is gaining and may pass it in 1960 if the Soviet economy continues to expand at its recent rate. Venezuela output rose 164,500 b/d or 6.3% to 2,769,420 b/d.

Most spectacular changes were in Africa where output of the new Sahara fields rose 70.6% following completion of a pipeline outlet. Average production for the year was only 16,600 b/d, however, and an even greater jump in output is anticipated in 1960. Nigeria and Gabon both reported large percentage increases and Africa as a whole (exclusive of Egypt which is included with the Middle East) rose 52.4% but only to 41,150 b/d.

Western European crude output was largely unchanged in 1959 except in Western Germany where an active drilling campaign raised domestic oil supplies 12% to 98,600 b/d. Total for the whole area rose only 7,280 b/d, less than 10% of the amount required to meet consuming demands.

Output of Middle East nations increased 215,090 b/d or 5% in 1959 to 4,545,260 b/d. Kuwait continued to be the leading producer with an output of 1,390,000 b/d but this was a small decrease under 1958.

TABLE II

PERCENTAGE DISTRIBUTION OF WORLD CRUDE PRODUCTION

Principal Countries	1959	1958
United States	36.4	37.0
Venezuela	14.3	14.4
USSR	13.2	12.6
Kuwait	7.2	7.7
Saudi Arabia	5.5	5.6
Iran	4.4	4.5
Iraq	4.3	4.0
Canada	2.6	2.5
Indonesia	1.8	1.8
Mexico	1.4	1.4
Romania	1.2	1.3
Borneo	.5	.6
Principal Areas		
North America	40.5	40.9
South America & Carrib.	17.0	16.9
Western Hemisphere	57.5	57.8
Europe (excl. USSR)	1.3	1.3
Middle East	23.5	23.9
Asia and Australasia	2.8	2.8
Eastern Hemisphere	42.5	42.2
USSR Satellites[1]	14.6	14.1

[1] Does not include Communist China.

The year was not marked by any major changes in the proportion of the world's oil produced by various areas or the major producing nations. The USA continued its downward trend and the USSR still was rising. As indicated in Table 2 the USA produced 36.4% of the world's oil supply in 1959 compared with 37% in 1958 while the USSR rose from 12.6 to 13.2%. Western hemisphere output fell from 57.8% to 57.5% of the world total. The rise in the eastern hemisphere's proportion was entirely due to the USSR since the Middle East showed a slight drop, from 23.9% to 23.5% while other areas were steady.

TABLE I

WORLD CRUDE OIL PRODUCTION

(Barrels Daily)

Country	1958[1]	1959[2]	% Change
United States	6,709,150	7,050,000	+5.1
Canada	453,500	500,800	+10.4
Mexico	256,250	266,400	+4.0
TOTAL NO. AMERICA	7,419,900	7,817,200	+5.5
Argentina	98,160	117,500	+19.7
Bolivia	9,400	8,350	−11.2
Brazil	51,830	64,500	+24.4
Chile	15,260	17,300	+13.4
Colombia	131,370	142,500	+8.5
Cuba	940	560	−40.4
Ecuador	8,520	8,000	−6.1
Peru	51,230	50,200	−2.2
Trinidad	102,340	112,040	+9.5
Venezuela	2,604,920	2,769,420	+6.3
TOTAL SO. AMER. & CARIB.	3,074,060	3,290,370	+7.0
TOTAL WEST. HEMISPHERE	10,493,960	11,107,570	+5.9
Austria	53,550	45,300	−15.4
France	27,360	27,700	+1.2
Germany (West)	88,020	98,600	+12.0
Italy & Sicily	28,660	31,000	+8.2
Netherlands	30,980	32,000	+3.3
United Kingdom	1,600	1,700	+0.6
Yugoslavia	8,950	10,100	+12.8
TOTAL WESTERN EUROPE	239,120	246,400	+3.0
Angola	980	800	−2.0
Gabon	9,360	13,500	+44.2
Morocco	1,530	1,850	+20.9
Nigeria	5,400	8,400	+55.6
Sahara (OCRS)	9,730	16,600	+70.6
TOTAL AFRICA	27,000	41,150	+52.4
Albania	9,290	9,000	−3.1
Bulgaria	5,500	5,900	+7.3
Czechoslovakia	2,600	2,600	0
Germany (East)	800	800	0
Hungary	14,000	14,100	+0.7
Poland	3,700	3,700	0
Romania	229,000	231,000	+0.9
USSR	2,285,550	2,550,000	+11.6
TOTAL USSR & SAT.	2,550,440	2,817,100	+10.5
Bahrain	40,750	45,110	+10.7
Egypt	60,570	58,780	−3.0
Iran	825,650	855,000	+3.6
Iraq	729,110	826,040	+13.3
Israel	1,760	2,500	+42.0
Kuwait	1,396,310	1,390,000	−0.02
Neutral Zone	80,740	114,700	+42.1
Qatar	173,730	172,100	−0.9
Saudi Arabia	1,015,030	1,070,080	+5.4
Turkey	6,520	6,950	+6.6
TOTAL MIDDLE EAST	4,330,170	4,541,260	+5.0
British Borneo	108,360	104,300	−3.7
Burma	9,460	10,200	+7.8
China (Communist)	40,000	60,500	+51.2
India	9,450	8,900	−5.8
Indonesia	325,250	341,000	+4.8
Japan	7,020	7,600	+8.3
New Guinea	5,070	5,100	+0.6
Pakistan	6,230	9,800	+57.3
TOTAL ASIA & AUSTRALASIA	510,840	547,400	+7.2
TOTAL EAST. HEMISPHERE	7,657,570	8,193,310	+7.0
WORLD TOTAL	18,151,530	19,300,880	+6.4

[1] 1958 production figures are those of the U.S. Bureau of Mines except in the case of Communist China. Bureau of Mines estimated 16,600 b/d as the output of Communist China fields in 1958 giving a world total of 18,133, 000 b/d.
[2] Preliminary estimates by World Petroleum.

1959 Demand 20,555,000 b/d

World demand for crude petroleum and hydrocarbon liquids rose 6.9% in 1959. Outlook for 1960 is for a 6% increase to 21,789,000 barrels daily. Long term supply outlook is easy

PRELIMINARY ESTIMATES of world consumption of petroleum including crude and other liquid hydrocarbons indicate an increase of 6.9% in 1959 to 20,555,000 barrels daily. The increase was about the same as that experienced the previous year on a world-wide basis but rates of growth shifted as between eastern and western hemispheres. North American demand was considerably higher than in 1958, especially in Canada while the rate of growth in Europe was somewhat less.

It is estimated that the demand curve will tend to flatten again in 1960 with the result that apparent consumption will rise about 1,234,000 b/d or 6% compared with 1,330,000 b/d in 1959. Estimates presented in Table I are based on the views of economists of a number of international oil companies and are believed to be on the conservative side.

In Western Europe an increase of 8.3% is forecast compared with a rise of about 10% in 1959. USSR and satellites consumption is estimated 9.9% higher compared with a rise of 11.6% in 1959. Some of the consuming areas in Europe have enjoyed a phenomenal boom during the past year. The United Kingdom and Western Germany are prime examples. Rates of increase in some other areas also have been highly satisfactory.

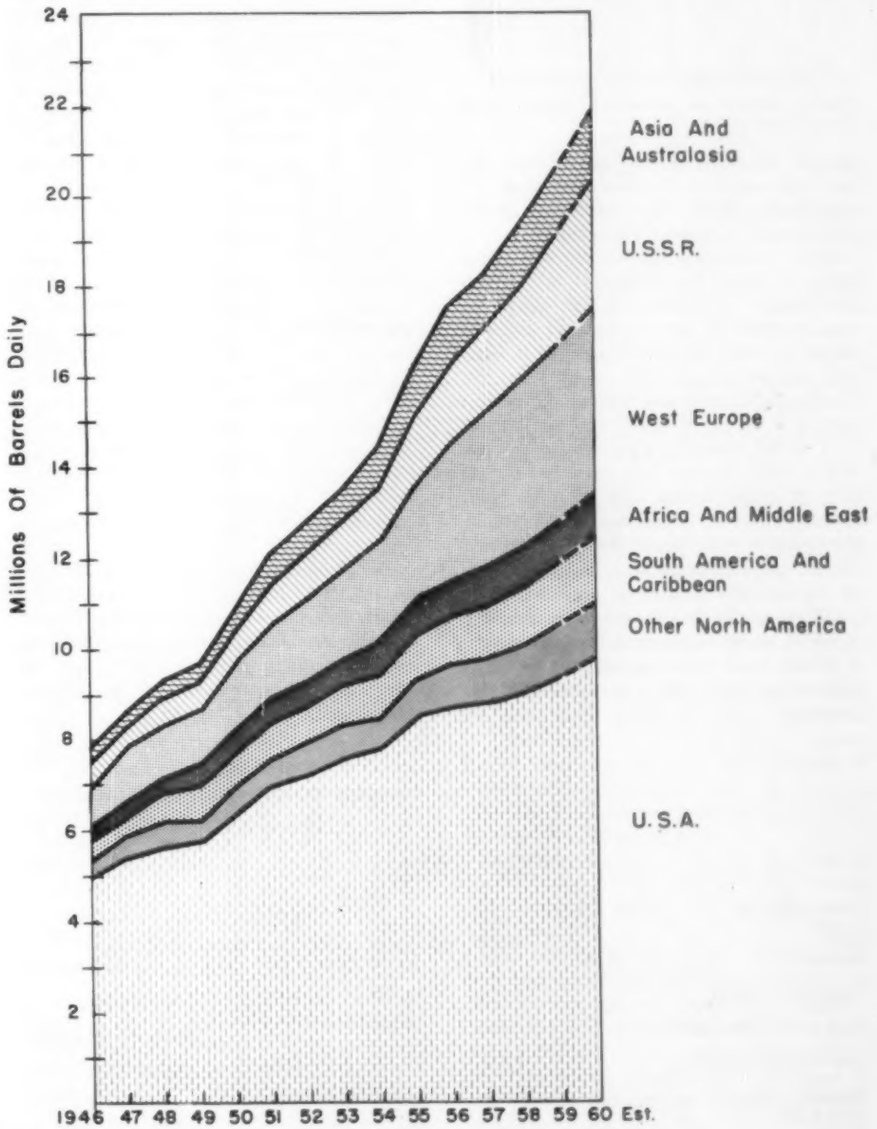
In the far east, Japan has had a resurgence of industrial activity with the result that an increase of 19% in internal demand in 1959 is indicated. Demand for bunkers has shown little change, however. Australia has reported an increase of about 6.5% in inland demand although bunker liftings were off by 19% in the first half of the past year. As a whole Asia and Australia have had an increase of about 8% in 1959. Inland consumption was up 9.5% and bunkers 2.1%. Outlook for 1960 is for an increase of 8.8% in 1960.

For the Eastern Hemisphere as a whole it is estimated that demand will rise 8.5% in 1960 compared with an increase of 4.2% in the western hemisphere.

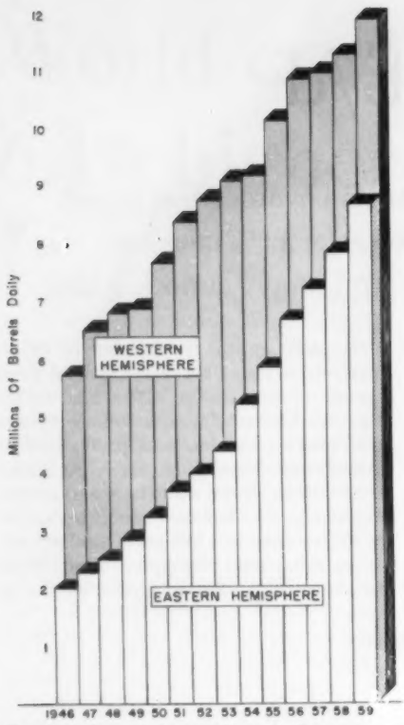
M. E. Hubbard of British Petroleum Co. has estimated an average annual increase of 7.5% during the first half of the new decade. He suggests that motor fuel and middle distillate demand will rise an average of 6.5% per year and residual fuel demand an average of 9% in the eastern hemisphere.

Long term outlook for the industry was considered by a panel of experts at the recent annual meeting of the American Petroleum Institute under the chairmanship of Walter J. Levy, economic consultant. At the outset of the meeting Mr. Levy pointed out that fears of an energy gap have subsided and we now are faced with a world energy surplus.

"Oil discoveries which give promise of extraordinary size have been made in several foreign countries, particularly in North Africa," he said. "And while this dramatic expansion of supplies has been taking place abroad, our domestic oil supply situation has virtually marked time. A great amount of exploratory effort has shifted from the United States to other Western Hemisphere countries, and particularly to many Eastern Hemisphere areas. As a matter of fact, there are many here and abroad who believe that our own producing industry will soon enter a period of decline, and that only a most expensive effort could maintain United States production at its



Trend of demand for petroleum by major geographical areas.



Trend of demand for petroleum in Eastern versus Western hemispheres.

present potential. On the other hand, foreign oil search is yielding the most extraordinary results, and apparently holds even greater promise for the future."

In a concluding statement, Mr. Levy said: "It might be of interest to mention that rough calculations of the petroleum requirements of the free world for the period of 1959-1985 would amount to some 365 million barrels. The total new discoveries required would be about 425 billion barrels if 13 to 14 years' proven reserves were to be maintained world-wide at the end of 1985. You see that our needs during these 27 years would appear to be comfortably covered. Certainly, this should be the outcome if oil search and development abroad are conducted with but a fraction of the intensity which has prevailed here.

"There would thus appear to be available to all of us abundant and low-cost energy if we only knew how to handle our problems and arrange our affairs economically and rationally. Later on there might well be problems. However, we have time, it would appear, to develop ample unconventional energy resources, which will ultimately relieve fossil fuels from part of their responsibilities and supplement them.

"There is now I believe one very important question which the United States must consider. Even if we accept the conclusion that it is possible to maintain a substantial increase in U.S. crude production in accordance with the overall increase in energy demand at real costs not higher than at present, the real cost of foreign crude might well decline. This suggests that the U.S., in contrast to other areas of the world, may find itself increasingly dependent on relatively high-cost domestic energy sources. Is this a choice the U.S. should consciously make? And if so, what are the implications for U.S. exports in world markets? Should not all these deserve most serious consideration in the formulation of any future United States oil policy?"

Minor S. Jameson, Jr., executive vice president of the Independent Petroleum Association of America, gave an optimistic view of the long term outlook for U.S. oil supply. He said that, "There are differences of opinion as to future rates of growth in U.S. oil consumption, but the consensus points to continued increases in total demand for petroleum liquids at a rate approximating the anticipated increase in total U.S. energy requirements. To illustrate the order of magnitude of the total supply that would be required, a total of about 100 billion barrels of new petroleum liquids would have to be made available from domestic sources during the next twenty years, on the assumption that U.S. production keeps pace with the demand and the present ratio of production to proved reserves is maintained. In comparison, a total of 62 billion barrels was found and developed in the United States during the past 20 years, equivalent to approximately 60% of the amount needed during the coming 20 years."

Mr. Jameson quoted Bruce C. Netschert's book "The Future Supply of Oil and Gas" which carried an estimate that the U.S. can recover 500 billion barrels of oil and concluded that "it seems unlikely that the physical stock of petroleum will be a limiting factor in the next 20 years.

"There is considerable justification for concluding that technological advances alone could be the factor responsible for providing a substantial part of the additional domestic oil supply required during the next 20 years," he said. "To illustrate, newly developed techniques of increasing recovery are reported to have approached 100% recovery in pilot operations as compared with an average recovery under present methods that has been estimated at approximately one-third of the oil in place.

"Although it is most difficult to make quantitative estimates of the effect of new recovery techniques, it should be noted that productive capacity for total petroleum liquids in the United States increased 77% during the past 10 years while proved reserves increased 37%. It has been estimated that more than 200 billion barrels of oil are known to exist but are currently unrecoverable, and it is reasonable to expect that improved technology may make available billions of barrels of additional supply from these sources through 1980. It is equally apparent that technological progress in other phases of exploration, development, and production must be given adequate consideration in any appraisal of the long-term outlook for U.S. oil supply."

Considering the rising cost of finding new oil in the USA, Mr. Jameson showed that there has been no upward trend in the price of oil in terms of constant dollars. Costs could be very greatly affected by government tax policies, Mr. Jameson said.

M. E. Hubbard, head of economic relations for British Petroleum Co., London, discussed the long term outlook for oil supplies in the eastern hemisphere. He began his report with an estimate of oil which should be available for the next 20 years as follows:

	Proved Reserves Jan. 1, 1959	Available for next 20 years
	(Billions of Barrels)	
Middle East	175	250
Western Hemisphere (Excl. USA)	27	100
Far East	10	20
Europe	1.5	3
North Africa	6.5	50
	220	say 425

TABLE I

WORLD CONSUMPTION OF PETROLEUM [1]

(Thousands of Barrels Daily)

	Preliminary 1959	Estimated 1960	Percent Increase
Alaska & Hawaii	50	53	6.0
Canada	822	875	6.4
USA	9,482	9,820	3.6
Mexico	286	300	4.9
Total North America	10,640	11,048	3.8
South America and Caribbean	1,260	1,350	7.1
Total Western Hemisphere	11,900	12,398	4.2
Western Europe	3,600	3,900	8.3
USSR & Satellites	2,625	2,885	9.9
Total Europe	6,225	6,785	9.0
Africa	500	525	5.0
Middle East	490	515	5.1
Asia & Australasia	1,440	1,566	8.8
Asia & Africa	2,430	2,606	7.2
Eastern Hemisphere	8,655	9,391	8.5
World Total	20,555	21,789	6.0

[1] Figures are on a crude and other hydrocarbon liquids equivalent basis and include manufacturing, shipping and storage losses.

TABLE II

APPARENT DEMAND REFINED PRODUCTS (U. S. BUREAU OF MINES)

(Barrels Daily)

Country or Area	1957	1958	Percent Increase
Canada	637,440	662,170	3.9
Costa Rica	3,040	3,520	15.8
Cuba	72,300	60,950	−15.7
Dominican Repub.	6,360	6,600	3.8
El Salvador	3,470	4,590	32.3
Guatemala	6,590	7,840	19.0
Haiti	1,980	1,920	−3.0
Honduras, Brit.	270	250	−7.4
Jamaica	11,820	12,320	4.2
Mexico	223,070	233,860	0.4
Nicaragua	3,050	3,050	0
Panama Canal Zone	22,970	14,800	−35.6
Panama	5,560	6,520	17.3
Puerto Rico	35,860	30,550	−14.8
Trinidad	38,280	42,810	11.8
USA (Incl. Alaska & Haw.)	7,466,380	7,587,690	1.6
NO. AMER. & CARIBB.	8,538,440	8,679,440	1.7
Argentina	234,820	238,870	1.7
Bolivia	6,060	5,650	−6.7
Brazil	193,000	214,380	11.1
Chile	38,670	38,260	−1.1
Colombia	44,820	46,830	4.5
Ecuador	8,360	8,400	0.5
Neth. Antilles		156,960[1]	
Paraguay	1,560	1,610	3.2
Peru	41,150	41,620	1.1
Uruguay	28,770	25,670	−10.8
Venezuela	140,180	127,420	−9.1
SO. AMERICA	739,720[2]	905,670[3]	1.2[3]
Austria	36,270	39,590	9.2
Belgium & Luxem.	115,180	123,470	7.2
Denmark	72,480	87,440	20.6
Finland	35,340	27,810	−21.3
France	358,490	398,840	11.3
Germany, West	298,170	372,240	24.8
Greece	32,380	36,060	11.4
Iceland	6,630	6,520	−1.7
Ireland	20,470	21,010	2.6
Italy	238,220	280,230	17.6
Netherlands	144,150	157,620	9.3
Norway	61,820	62,370	0.9
Portugal	27,020	28,130	4.1
Spain	77,630	78,940	1.7
Sweden	174,650	190,620	9.1
Switzerland	54,900	63,310	15.1
United Kingdom	552,680	680,690	23.2
Yugoslavia[4]		20,660	
WESTERN EUROPE	2,306,570	2,675,550	16.0
Aden		66,930	
Bahrain	15,380	17,970	16.8
Iran		77,430	
Iraq	28,850	33,130	14.8
Israel	26,730	28,710	7.4
Jordan	2,740	3,450	25.9
Kuwait	37,470	52,650	40.5
Lebanon	13,400	12,340	−7.9
Neutral Zone		980	
Saudi Arabia	41,420	38,410	−7.3
Turkey	28,240	39,060	38.3
UAR. Syria	12,140	13,910	1.5
MIDDLE EAST	206,370	384,970[5]	16.1[5]
Burma	6,580	7,990	21.4
Cambodia & So. Vietnam	10,330	12,810	24.0
Ceylon	27,320	18,430	−32.5
India	115,620	118,910	2.8
Japan	289,580	323,440	11.7
Korea, South		13,540	
Malaya & Singapore	73,150	71,950	−1.6
Pakistan	36,990	39,380	6.5
Taiwan	12,470	14,150	13.5
Thailand	18,000	17,630	−2.1
ASIA	590,580[6]	638,230	8.1
Algeria	17,140	21,370	24.7
Angola	3,290	3,610	9.7
Belgian Congo	10,000	10,100	1.0
Canary Islands		17,990	
Ethiopia	1,920	2,310	20.3
States formerly in Fr. Equator. Africa	2,700	5,240	94.1
Fr. West Africa	42,730	28,860	−32.5
Ghana	7,480	7,830	4.7
Kenya	17,600	14,660	−16.7
Liberia	680	1,160	70.6
Madagascar	2,400	2,610	8.8
Morocco	13,180	13,660	3.6
Nigeria	10,770	12,050	1.2
Rhodesia & Nyasaland	9,580	10,220	6.7
Sudan	6,820	8,730	28.0
Tanganyika	5,010	4,960	−1.0
Tunisia	8,500	8,040	−5.4
Uganda	2,700	2,920	8.1
Union So. Africa	85,640	72,450	−15.4
UAR, EGYPT	71,420	75,150	5.2
AFRICA	319,560	323,920	1.4
Australia	173,550	179,710	3.5
British Borneo		11,220	
Indonesia	67,620	65,990	−2.4
New Caledonia	1,160	1,070	−7.8
New Zealand	34,990	34,430	−1.6
Philippines	41,500	40,550	−0.2
OCEANIA	318,820	332,970	4.4
WORLD TOTAL, excluding, USSR, East Europe & Mainland China	13,020,060	13,575,040[7]	4.3[7]

[1] Netherlands Antilles (not reported in 1957), influenced heavily by refinery fuel and losses, bunker loadings (incl. aviation bunkers), and stock changes.

[2] So. America total for 1957 includes Brit. Guiana, 2,330 b/d.

[3] So. America total for 1958 includes Neth. Antilles. Percent change based on total exclusive of Neth. Antilles, which is 748,710 b/d.

[4] Yugoslavia not reported for 1957.

[5] Middle East total for 1958 includes all countries. shown. Percent change based on total excluding Aden, Iran, and Neutral Zone, which is 239,630 b/d.

[6] Asia total for 1957 includes Afghanistan, 540 b/d.

[7] World total for 1958 and percent change includes all countries reported for both 1957 and 1958. If it included all countries shown for 1958, the 1958 world otal would be 13,940,750 b/d and percent change would be 7.1%.

Present reserves in Communist countries were estimated at 30 billion barrels.

Commenting on results in the Sahara, Mr. Hubbard pointed out that exploration costs to date are about 20 cents per barrel, not far different than those in the Middle East.

Mr. Hubbard said that "At present we undoubtedly have ample reserves in the world to meet any foreseeable immediate future demand. And if this demand should, for any reason, rise faster than we now envisage the additional exploration effort and technical improvements excluded from the 20-year availability figure I have given, it would certainly allow increased production.

"Moreover, and thank goodness, there is an ever widening number of sources of oil which correspondingly reduces political risks. Some of the areas do not, perhaps, provide 100% security, but the fact that no area is now in a commanding position, capable by denying its oil to cause a general shortage, does in itself reduce the risk of dramatic action on the part of any country.

"The oil industry is in a fortunate position both for itself and for the world. We supply, and can continue to supply, energy in its most useful and, in general, in its cheapest form. Production costs are falling in many parts of the world as output rises and new provinces are discovered.

"Economic progress is the theme of our time. This progress depends on cheap energy —is that not one of the main reasons for the prosperity of your country?

"Over the past decade or so price movements have been generally favorable to oil.

"The inherent cheapness of oil has been a very material factor in the remarkable change that has come over the economic growth in Europe these last few years.

"We have competitors, of course.

"Coal productivity has doubled in the United States in the past 10 years.

"Natural gas, particularly in North America, is for various reasons, cheaper than oil in some areas.

"Hydroelectricity—but there is a limit to its growth.

"Two other forms of energy are on our heels. Shale and tar sands, either or both of which would and could take over some of the load if oil prices do not continue to fall in constant dollar values.

"Nuclear energy is already economic in areas remote from natural sources of energy and is bound to improve costwise pretty rapidly.

"So we must not be over-satisfied with our own performance. Our future depends first on being able to make oil available—and that we can certainly do for a long time—and second on making it available at such a price as to retain our outlets and, in our own self-interest, at such a price as to contribute directly to the economic strength of the Free World." END

Australia's oil hunt in the Great Artesian Basin

Exploration effort grows in vast eastern area as operators find the Commonwealth government providing a degree of encouragement unique in the world.

by H. I. Harris and W. D. Mott

THE GREAT ARTESIAN BASIN occupies more than 600,000 square miles of the inland of eastern Australia. Covering almost half of Queensland, it extends westward into the Northern Territory, southward into New South Wales and southwestward into South Australia. More than twice the size of Texas, this area is attracting an ever-increasing number of American operators because of its oil potential and location in a politically stable, economically expanding country.

Geology. The Great Artesian Basin is a gentle down-warp filled with Mesozoic sediments which, since deposition, have suffered only slight deformation into broad anticlines and synclines with minor faulting.

The artesian beds consist of very porous quartz sandstones of Jurassic and early Triassic age separated by shales. These shales contain coal seams in the central-eastern areas. The sequence has a maximum thickness of some 2,500 ft, all of it considered to be non-marine origin.

Cretaceous sediments overlie the artesian sequence. They consist of about 2,600 ft of Lower Cretaceous marine mudstone and shale with minor sandstones and limestones and up to 1,500 ft of Upper Cretaceous sandstones and shales with some coal. Thin early Tertiary lacustrine deposits and Pliocene (?) laterites form plateaux, mesas and buttes up to 300 ft high on an otherwise monotonous topography.

Unconformably beneath the aquifer sequence are Lower Triassic shales and sandstones which have been met in some of the deep bores. These beds are exposed on the eastern margin of the basin.

They are of particular interest at Roma, in the eastern part of the Basin, where gas and oil have been found in several wells just above basement. Because of the presence of plant impressions and the lack of other fossil evidence, these beds, which are more than 1,000 ft thick, are usually considered to be of continental origin. They are well-bedded and generally dark in color so that it is quite possible that they may have marine or estuarine facies.

Oil Shows. At the turn of the century, the Roma area was the scene of Australia's first natural gas discovery. Some 25 years later this was followed by an oil boom.

In 1900, during drilling below the known artesian sequence in search of deeper water supplies, gas was met at 3,683 ft below surface in a well on the outskirts of the town of Roma. The flow was recorded at 50,000 to 70,000 cfd, with water. In 1906, after the well had been allowed to blow wild for five years, the gas was reticulated for town illumination. However, after ten days of operation, the flow ceased because of caving. The hole was abandoned and for twenty odd years only sporadic activity took place.

In 1928, another boom started when a newly-drilled well produced gas from which gasoline could be extracted. This gasoline well was close to the original discovery well and was in production for more than two years until silting and other problems caused its abandonment.

There was considerable additional activity during the following three years but lack of a truly commercial discovery caused a subsequent decline. The efforts did, however, prove that gas and oil showings extend at least 20 miles east of Roma and that oil impregnated sandstones occur as far as ten miles to the north.

Herbert I. Harris, chief geologist for Magellan Petroleum Corp. in Brisbane, Australia, has spent the last six and a half years in international oil exploration. A graduate of the University of Minnesota and UCLA, Mr. Harris spent several years with Texaco in the Rocky Mountain area as exploration geologist before entering foreign work in the Middle East in 1953. In mid-1959 he was transferred to Australia to initiate Magellan's program in Queensland.

W. D. Mott graduated B.Sc. from the University of Melbourne in 1937 and spent nine years on oil exploration with the Australasian Petroleum Co. in Papua and New Guinea. He served with the Royal Australian Air Force for four years as a Navigator based in the British Isles and later worked for a short period with British Petroleum in England and Scotland. Before commencing private practice in 1953, he had 2½ years with the Geological Survey of Queensland.

Gently-dipping Cambrian limestones at Black Mountain in Western Queensland. Photos on this page by H. I. Harris.

Steeply-dipping Cambrian limestones exposed at Black Mountain in Western Queensland.

Further wells were drilled by Associated Australian Oilfields during the period from 1952 to 1956. The company now has one shut-in well capable of producing approximately 1.25 million cfd of gas. It has an extensive program of future work planned for the area.

Oil and gas shows have been reported from numerous water bores in the basin and some, though insignificant in quantity, have persisted for half a century. At Longreach one such showing of gas was found in a bore which cut the pinchout of Jurassic beds against a buried granite ridge.

Deeper Prospects. It is not the Mesozoic sequence which creates the main potential of the Great Artesian Basin, but the underlying Palaeozoic rocks which constitute its floor. Permian sediments, partly marine in origin, dip beneath the Mesozoic rocks along the Basin's eastern margin. Signs of petroleum have been found in these rocks and they may prove to be the source of the Roma occurrences. In the northwest Cambrian and Ordovician sediments, mainly carbonates, and carrying some oil impregnations, are known to form the floor for some distance inward from that margin of the Basin. Geophysical work suggests that they may extend for a considerable distance. These rocks are well exposed at Black Mountain where they exhibit interesting structure. To the southwest, Cambrian limestones with impregnations of heavy oil have been proved to form the floor while Devonian sediments of marine origin form the floor of the southern margin of the Basin.

Early in the present decade, West Australian Petroleum Exploration Co. produced oil from its first well at Rough Range in Western Australia. This find triggered a modern oil boom throughout Australia during which the areas in the Great Artesian Basin which had produced oil shows were investigated by further drilling. These several wells were dry.

It was then that W. D. Mott realized the Basin was not as simple as had been generally believed. The floor of this vast area had to be made up of many different rocks, yet only the Mesozoic and Tertiary sequences showed structure. He felt there should be older rocks below the artesian sequence and that they should contain oil. Thus, in 1954, Mott formed a syndicate which took up an area in the northern part of the Basin. A portion of this area is now being investigated by Magellan Petroleum Corp. Magellan's geologists agree with Mott concerning the possibilities of Cambrian production in this part of the Basin.

Recent Exploration History. Santos Ltd., working from the southwest, and Australian Oil & Gas Corp., working from the south, soon became aware that exploration of this great area would be beyond the resources of small independents relying solely on the financial support of the Australian public. This was forcibly demonstrated to companies such as Westland Oil and Longreach Oil Ltd., which exhausted their capital before achieving very much.

The Great Artesian Basin oil possibilities were perhaps first foreseen by R. C. Sprigg, managing director of Geosurveys Pty. Ltd. of Adelaide. Exploration was aided by the forthright statement of Dr. I. A. Levorsen who said that the Basin had features comparable to other producing areas such as the Sahara desert in North Africa.

Recognition of extensive anticlines in the Mesozoic rocks of the central part of the Basin and seismic confirmation that they persist at depth led to the introduction of overseas capital to investigate the Basin.

Early in the play was Delhi-Taylor Corp., of Texas, which joined with Santos Ltd. Subsequently Vacuum and British Petroleum took an interest through the Australian company Frome-Broken Hill Pty. Ltd. in which Zinc Corp. has a one-third interest.

American companies of varying sizes now have tremendous acreage spreads in Queensland and adjoining states. Canadian companies have also taken up acreage. The accompanying map shows the areas under permit and the permit holders.

In Queensland, where the major portion of the Basin exists, important permit holders are Delhi-Taylor, Magellan Petroleum Corp., Phillips Petroleum, Sunray-Mid Continent, Stekoll, Conorada and Sterling.

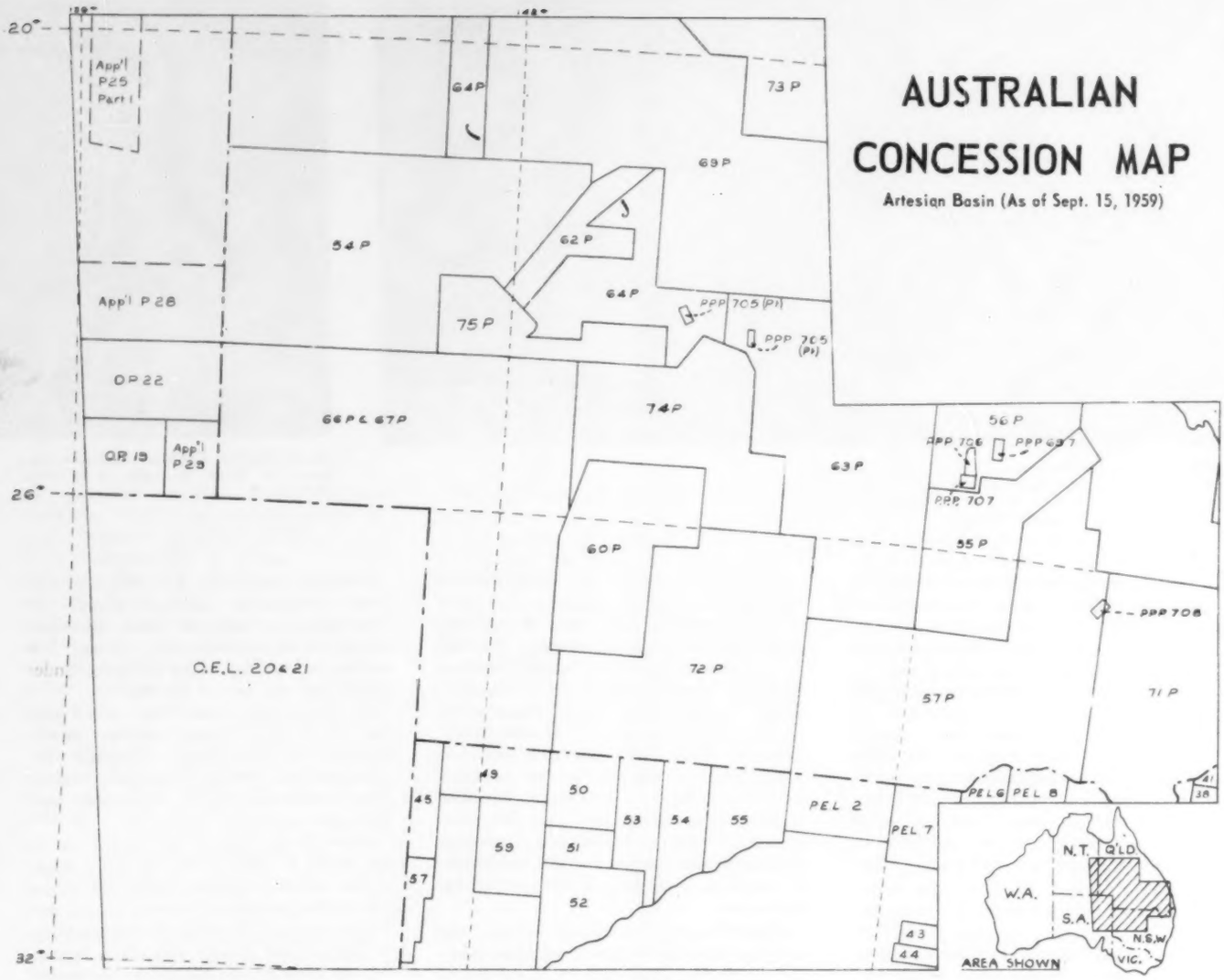
Most of the work to be carried out in the Basin is still in the planning stage. A few isolated wildcats have been drilled and limited geophysical surveys carried out. At the moment, Magellan Petroleum Corp. is carrying out gravity and aerial magnetometer surveys, and has surface geological and photogeological work well under way.

The Santos-Delhi-Taylor group is currently drilling a deep stratigraphic hole (Innamincka No. 1) and has a second hole scheduled at Betoota in Queensland.

Phillips-Sunray-Mid Continent, which recently acquired a large exploration area, will soon start a seismic program. With other aggressive operators such as Conorada, Stekoll, and Sterling on the scene, it can surely be stated that a huge burst of activity will shortly be initiated.

Much of the activity will be subsidized by the Commonwealth (Federal) government. Recently the government extended the 50% subsidy it was granting for stratigraphic drilling to cover 50% of the costs of approved geophysical surveys. A budget has been set up to assure grants until 1962. The understanding the government has shown to date indicates that it will continue to make monies available beyond that date.

The Australian Market. The awareness of an oil potential in the Great Artesian Basin of eastern Australia by substantial American oil companies is perhaps due as much to world oil politics as to the



LEGEND

Conorada Petroleum Company	75 P	Planet Exploration Co. Pty. Ltd.	P.P.P. 706, P.P.P. 697
Australian American Oil Co. Pty. Ltd.	74 P	J. G. Fuller	P.P.P. 707, 59
Papuan Apinaipi Petroleum Co. Ltd.	54 P	B. C. Hancox	38, 41
Associated Australian Oil Fields N.L.	55 P	Builders Inc. Pty. Ltd.	43
Associated Freney Oil Fields N.L.	56 P	J. A. O'Shea	44
Australian Oil & Gas Corp. Ltd.	57 P, P.E.L. 2, 7, 8	Clarence River Basin Oil Exp. Co. N.L.	45
L. H. Smart Oil Exploration Oil Exploration Co. Ltd.	60 P, 50, 51	P. E. Gauld	49
Magellan Petroleum Corporation	63 P	R. B. Withers	52, 53, 54, 55
Carpentaria Oil Pty. Ltd.	64 P	Harver Corporation Ltd.	57
Santos Ltd. & Delhi Aust. Petroleum Ltd.	66 P, 67 P	Geosurveys Australia Ltd.	P.O. 19
Artesian Basin Oil Co. Pty. Ltd.	69 P	3 States Australia Petroleum Ltd.	P. 28
Queensland American Oil Co. (½) Phillips (¼) Sunray (¼)	71 P	Texas American Oil Corporation	P. 29
Stekoll Australian Petroleum Ltd.	73 P	Trans Pacific Petroleum Exp. Synd.	P. 25
Phillips (½) Sunray (½)	72 P	Magellan Petroleum Corp. (¾) Cent. Q'Ld Pet. Co. Ltd. (¼)	62 P
Condamine Oil Ltd.	P.P.P. 708	Delhi Aust. Petroleum Ltd.	O.E.L. 20/1, O.P. 22
Longreach Oil Ltd.	P.P.P. 705	Santos Ltd.	O.E.L. 21/1

prospectiveness of the geology. Ten years ago the geology of the Artesian Basin was more obscure, yet recent activity has only slightly enhanced the broad oil prospects of the Basin.

The present abundance of oil in the world markets has caused many operators to take a second look at countries which are important users of petroleum products, yet have little or no production of their own. In these countries, a discovery is assured of an immediate market outlet. Turkey, France, Cuba, Israel, and Brazil come immediately to mind as areas whose geology has never been considered particularly exciting for an oil search. Yet all these countries have had tremendous sums spent in them recently by capable operators in an attempt to uncover new oil reserves. It is surely the demand for ready markets which has lured this exploration capital.

Australia is perhaps unique in the features it offers foreign oil risk capital. Perhaps of prime importance is the consumption and the pace of expansion in that consumption of oil products. During 1958 Australia consumed 8.7 million tons of refined products, a considerable amount for a nation which only recently could begin greater importance is the fact that the to boast of 10 million population. Of even 1958 total was 12.5% greater than the previous year. The continued broadening of local air travel, rapid jumps in motor car production and sales in Australia, and the seemingly endless expansion of industry appear to assure a continuing growth of the local market.

(*Continued on page 63*)

Whitegate...a symbol of processing partners and marketing competitors

THE SIGNIFICANCE of the new £12 million, 2 million ton/yr. (40,000 b/d) refinery built by Irish Refining Co. Ltd. at Whitegate (Cork), was emphasized in addresses given at the formal inauguration ceremonies by the Irish Prime Minister, Seán F. Lemas, and the chairman of the company, D. A. C. Dewdney.

A broad technical description of the new plant was published in WORLD PETROLEUM, July 15, 1959, pp. 84-90. Irish Refining Co. Ltd. is represented by Caltex, Esso, Shell-Mex and British Petroleum.

Evidence of the importance attached to the new Whitegate installation in the Irish industrial structure is the fact that the dedication ceremony was performed by Prime Minister Lemas. He termed the occasion as marking the passing of a new milestone in the extension of Irish manufacturing industry. The size and nature of the project illustrated that this development is now well into its second phase, in which larger units and more basic manufacturing operations will be normal.

"The aims of our industrial policy are clear," Mr. Lemas said. "The methods of realizing these aims must always be flexible. In the case of a complex undertaking such as an oil refinery, development by means of competent, private enterprise is a very sound method indeed which, in this case, assured not only access to world-wide experience, but also involved the minimum of change in existing internal trading arrangements—a very considerable advantage. In every way, this refinery represents the kind of development which we are very glad to see. It opens up other possibilities of development which are now being examined, bringing further prosperity to this part of our country."

Mr. Lemas then unveiled the triptych, a beautiful piece of work executed by W. Egan & Sons, Cork silversmiths since 1826. The three silver repoussé hand-engraved plaques are symbolic of ancient and modern Ireland: at the left, a round tower characteristic of ancient Irish architecture and below it a horse plough; at center, Cork Harbour with Cobh in the distance and the refinery jetty projecting into the bay; and right, a refinery tower and below it a motor tractor.

D. A. C. Dewdney, Chairman, Irish Refining Co., Ltd.

The chairman of Irish Refining Co., D. A. C. Dewdney, spoke of Whitegate as being an Irish refinery in conception and fact. "It starts a new industry for Ireland," he said, "and will make a significant contribution towards the steady progress of the Irish economy." The company had used and would continue to use Irish manpower and materials to the maximum extent possible. In terms of money, in the construction period alone, this had amounted to a direct expenditure in Ireland of three million pounds. Paying tribute to the unfailing cooperation received from every quarter, Mr. Dewdney said this had much to do with the company's ability to complete the project with such despatch. The Lummus Co., too, deserved thanks for their workmanship, and the refinery is one worthy of their fine reputation.

Mr. Dewdney laid particular stress on an interesting point—that Whitegate represented a cooperation but with strictly defined limits. He said:

"Here we have an exceptional situation of oil companies coming together, at a government's invitation, to promote a joint enterprise. It is very rare for this to happen in the oil industry, but it demonstrates our willingness when special circumstances arise to cooperate with a government's wishes for the greater good of the country concerned. Nonetheless, this joining of forces extends to the refining stage only. When it comes to marketing the products which the refinery will produce, then the full force of the factor of competition will remain unchanged, and I do not believe there is any industry in the world where competition for markets is fiercer or better sustained than it is in the oil industry.

"I think it important for it to be understood that the marketing affiliates of the partner companies in this enterprise will operate entirely independently. The competition between them will, I am sure, be as vigorous here as it is anywhere else in the world. This is no shareout or monopoly move, and it would be contrary to all our long-established principles of doing business to make it so. This is how we view the undertaking, and that is how we believe we can best serve the interests of the Irish market, and indeed, of any market. END

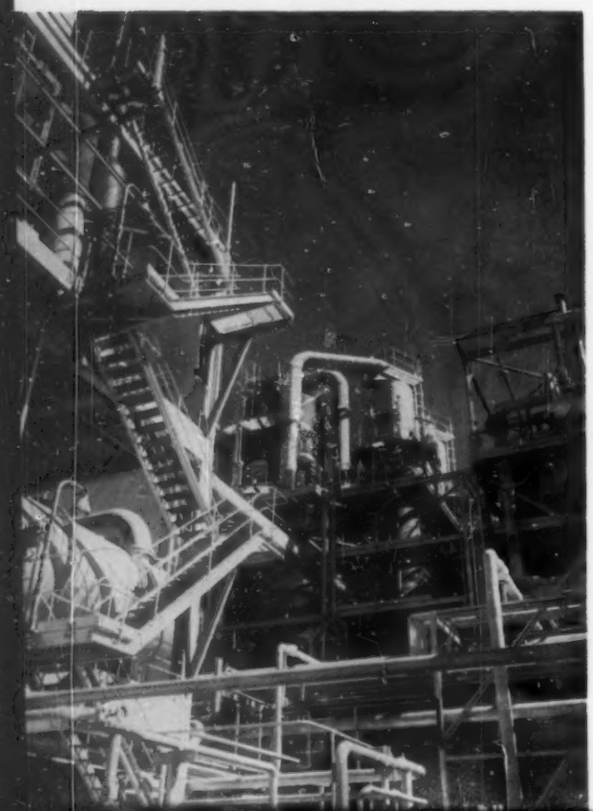
Dr. R. R. Lawton, general manager, Irish Refining Co. Ltd.

General view of Imperial Chemical Industries Ltd. Wilton manufacturing facilities. New No. 3 olefine plant in right background.

ICI commissions third olefine plant at Wilton

by **Cecil W. Wood**
European Editor

New unit boosts ethylene capacity 60%; includes first installation of free piston engines in a large manufacturing operation.



Overhead condensers, primary fractionator, and soaker lines of new olefine plant.

THE UNITED KINGDOM potential for ethylene has been considerably enhanced by the recent commissioning of the No. 3 Olefine Plant at Wilton Olefine Works by Imperial Chemical Industries' Heavy Organic Chemicals Division (HOCD).

With a capacity of 44,000 ton/yr, this raises the company's total capacity of high-purity ethylene by 60%, to about 110,000 tons, and olefine capacity to 230,000 tons, derived from 550-600,000 ton/yr of light naphtha feedstock. Nos. 1 and 2 Olefine Plants, commissioned in 1951 and 1956 respectively, are each 33,000 tons capacity. Plans are already under consideration for increasing total annual output to 140,000 tons by additions to and modifications of the three plants.

The Olefine Works and the associated ICI plants at Wilton and Billingham (the latter linked to Wilton by 11-mile pipelines under the River Tees) now form the largest petro-chemical complex outside the USA, and the largest anywhere based on liquid feedstock. The proportion of raw materials other than petroleum used by HOCD is diminishing steadily.

About 90% of the ethylene made at Wilton goes to the nearby Plastics Division plants for the production of "ALKATHENE" grades of polythene, and the remainder forms the base material for producing ethylene oxide and ethylene glycol in adjacent plants. Plans for extending the ethylene oxide plant are at an advanced stage and a direct oxidation method may be used for ethylene oxide instead of the chlorhydrin route.

Propylene of 95% purity, the next most important product of the olefine plants, goes to Billingham for making isopropanol and butanols, but a plant is being installed at Wilton to give a higher purity propylene which will form the base material for a Plastics Division plant to make "Propathene," the ICI grades of the new plastic, polypropylene. The construction of this 20 million lb/year plant has been advanced and it may be operating well before the original date set of end-1960. Among other ICI plants dependent on the products of the three olefine plants are those making "Terylene," detergents, and "Butakon" synthetic rubbers. Propylene oxide and propylene glycol are on the HOCD development program and plans are in hand for making them on a large scale.

Largely dependent, too, on Wilton output are the alterations in progress at Billingham Oil Works, which include increasing the synthetic phenol plant production from 15,000 to 20,000 tons a year. A third car-

bonylation alcohols plant was started up in July and already plans are in hand for further expansion. Current plant capacity of 60,000 ton/yr makes it easily the largest of its type in the world.

Development work on new products, particularly higher alcohols for making detergents, are leading to additions to the present range. In November 1959, it was announced that isodecanol had been added to the sales range of carbonylation alcohols manufactured—the first time that commercial quantities have been made in the United Kingdom.

It is worthy of mention that Wilton output of petrol has now reached the rate of about 200,000 ton/yr, and ICI claims it now makes regularly some 5% of the premium grades sold in the UK. Incidentally, the production of petrol at Billingham by the hydrogenation of creosote ceased September 1958 and much of the equipment so released was incorporated in the third carbonylation plant.

Confusion is found to exist still as to the responsibility and orbit of the Heavy Organic Chemicals Division since this was only formed in 1958. Broadly its function is to make raw materials for other divisions and for external sale. It assumed responsibility for the company's main interest in basic organic chemicals, one previously vested in the Billingham division. Thus its orbit, not always realized, covers parts both of Wilton with its Olefine Works and of Billingham with the Oil Works.

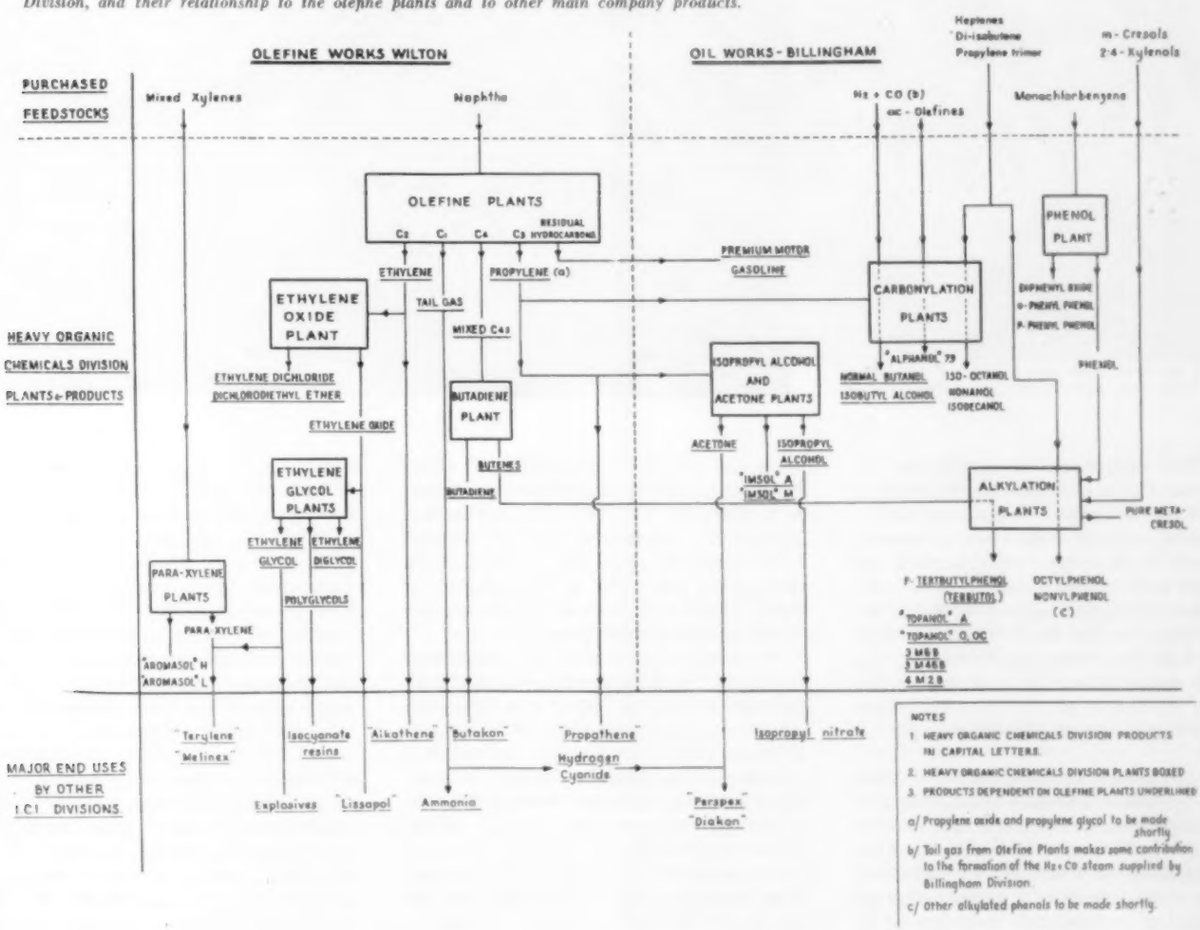
Battery of 15 free piston gas generators for driving compressors in new Wilton olefine plant.

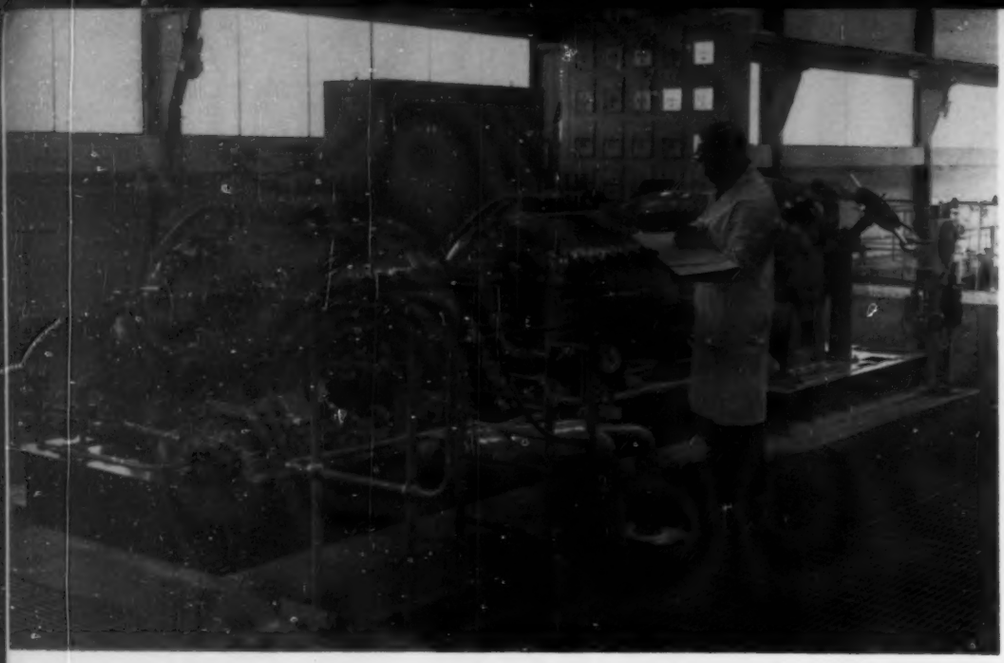
HOCD processes and products, and their relationships to the olefine plants and to other main company products, are shown broadly in the accompanying chart.

The olefine plants have all been built by Kellogg International Corp. and are based on a steam cracking process developed in its laboratories. Now well known, the process was untried in a full-scale plant when ICI decided to adopt it over 10 years ago. The calculated risk then taken is one which has proved eminently successful. The revelation that all products from the No. 3 plant were on specification within 10 days from startup is regarded by ICI as firm evidence of the benefit of experience gained on the earlier plants allied to good process design and plant workmanship.

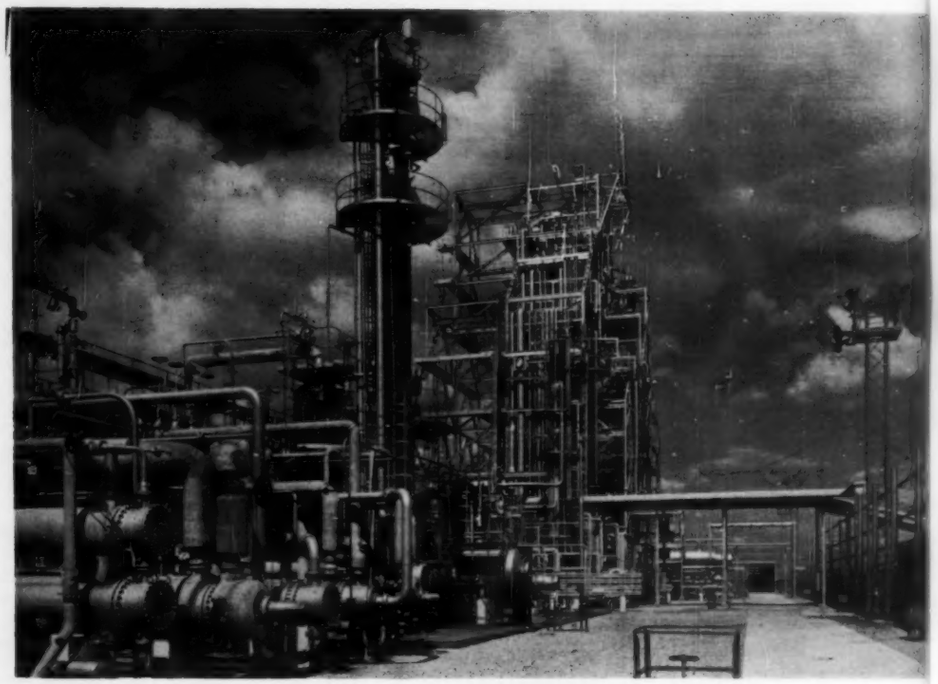
A recent visit to Wilton afforded opportunity to learn something of the changes incorporated in the latest "cracker". Clean layout is the immediate impression and the reduced plant size compared to the earlier units. The latter is due to a number of factors but principally to placing the overhead condensers at grade instead of in the struc-

Schematic chart indicates main products and processes of ICI's Heavy Organic Chemicals Division, and their relationship to the olefine plants and to other main company products.





A part of the olefine plant installation of gas expansion turbines and centrifugal compressors.



Part of gas separation plant; fire wall to right of steam lines and hydrocarbon gas safety ejectors.

ture. This replacement of gravity flow has been made possible by the development by ICI of the techniques of pumping hydrocarbons at temperatures as low as minus 40C in standard pumps fitted with standard mechanical seals. Replacement of the original ammonia absorption system used on the No. 1 plant for the first refrigeration stage by an entirely compressive system has also helped reduce plant size, and higher operating pressure in the fractionating system has permitted column diameters to be reduced.

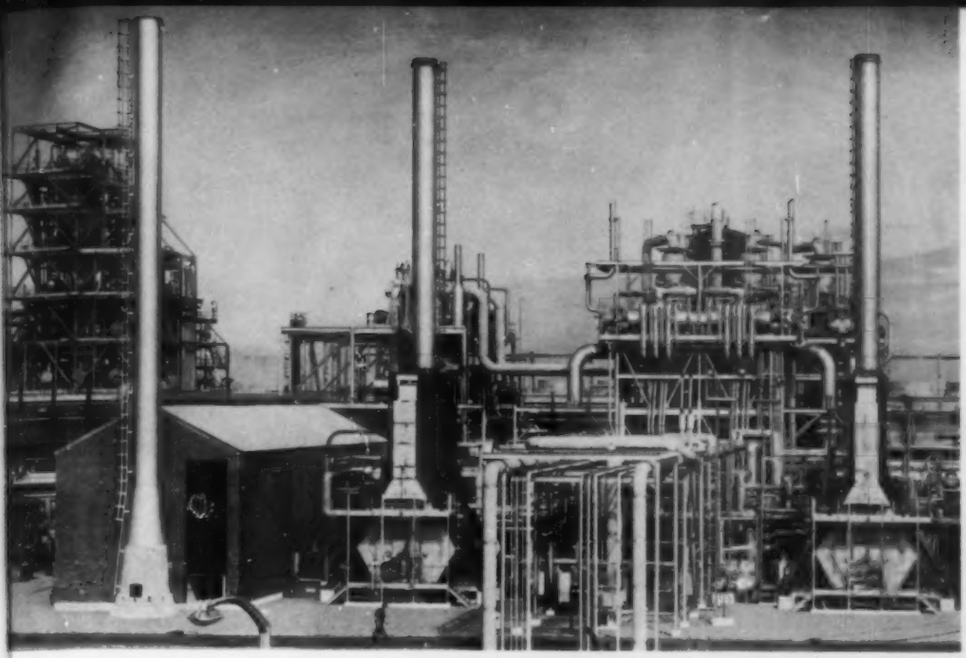
Refrigeration is provided on No. 3 plant by a propylene compression system and a 2-stage ethylene compression system in cascade with it. Finally, to get the lowest temperature required for separating methane and lighter gases, instead of a further stage of refrigeration compression, methane is let down in pressure and evaporated. This modification of the demethanization process is believed to be important and it has reduced the elements of cascade required from three to two. Nearly 100% pure methane is produced—a new product at Wilton, albeit a relatively minor contribution to the overall product picture.

An outstanding feature of engineering novelty in No. 3 Olefine Plant is the incorporation of a battery of 15 free piston gas generators, each producing the equivalent of about 1,000 shaft hp and supplying hot gas into a ring distributor which feeds six expansion gas turbines driving the six centrifugal compressors, totaling about 14,000 hp in all.

This is the first such application in any large manufacturing establishment in the world, and thus the importance of the results obtained cannot be overestimated. It is intended to change to a light residual fuel oil shortly for these engines.

Thirteen of the 15 free piston gas generators were supplied by Soc. Industrielle Generale de Mecanique (Paris) and two by Free Piston Engine Co. Ltd. The turbines were supplied by Brush Electrical Engineering Co. Ltd., and the compressors by Clark Brothers and the Carrier Corp. The free piston gasifiers are the standard GS. 34 as manufactured by all licensees.

ICI is not yet prepared to release any information on the several months' operational experience to date, but it believes the installations will prove to give high efficiency at a reasonable capital cost. To test this pioneering installation to the maximum, the aim is to run it non-stop at full rate for three years except for some easedown periods at



New No. 3 olefine plant with Kellogg steam cracker in center foreground.

New olefine plant at Wilton in a night-time view.

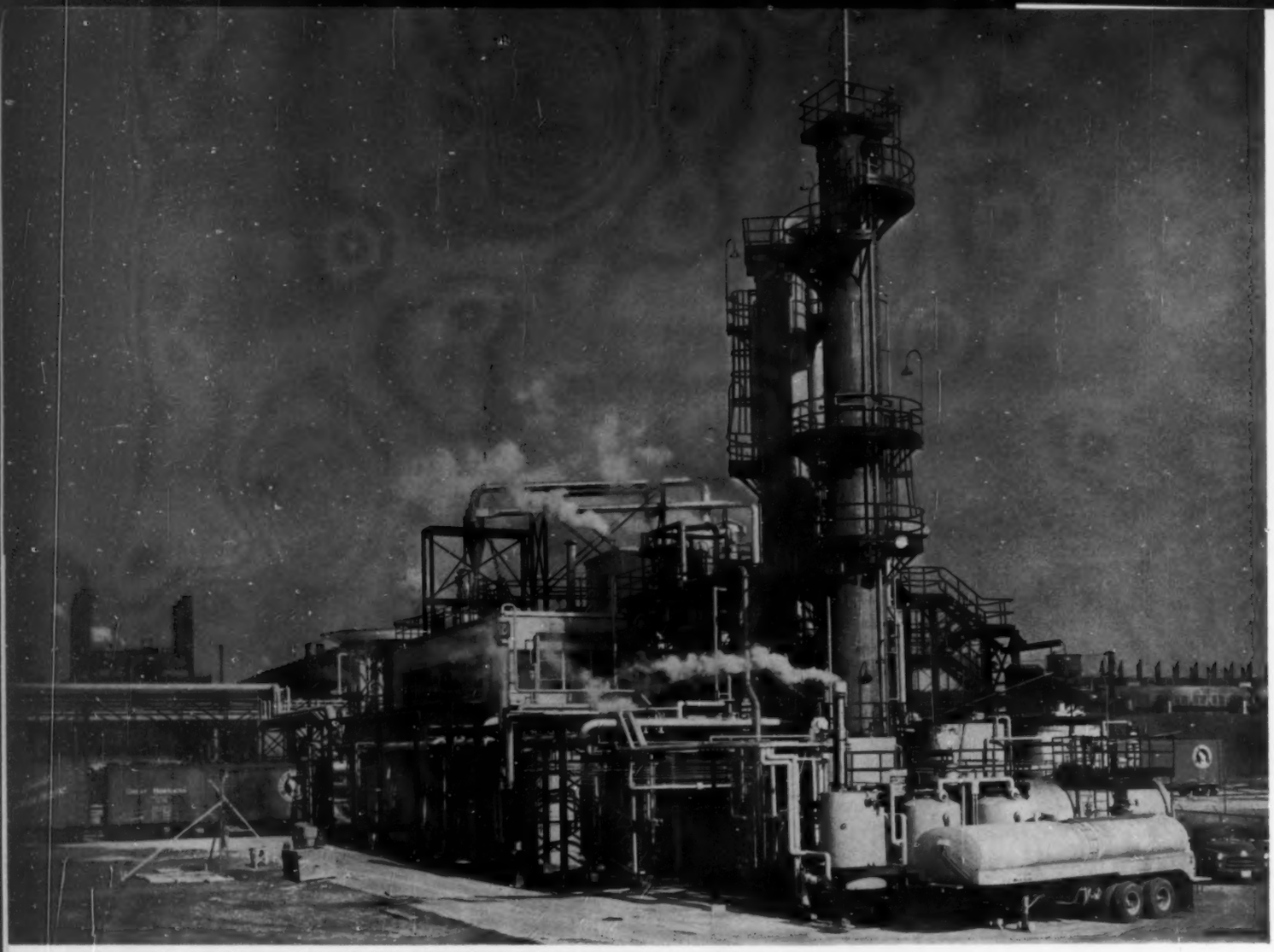
specified intervals for the statutory examination of certain items. It is hoped to run the No. 3 plant as a whole for a similar period without complete shut-down and the compressor installation will be expected to meet this.

It is possible, however, to indicate some of the factors which must have influenced the decision to adopt this relatively new form of motive power. Gas turbines are held to be particularly suitable for driving rotary machines because the turbine speed can be matched exactly to that of the driven unit, in this case the gas compressors. As a result, no intermediate gearing is needed, an important factor from several angles. The cheapness of the fuel oil to be used will more than compensate for the slightly lower overall efficiency of a free piston engine as compared with a diesel. Maintenance costs, an especially important point, are not expected to be as high as on the engines on the Nos. 1 and 2 plants. Continuous maintenance of the gassifiers is made possible by the installation of 15 engines, only 13 of which are expected to be operated at any one time. There is also the important factor that the gas temperature is such that special steels are not needed for the gas turbines, not only reducing overall cost but also making for long life with low maintenance charge.

Because of such factors as these, ICI confidently expects its choice of free piston engines to prove as justified as did its choice, over 10 years ago, of the then commercially untried Kellogg steam cracking process as the focal point of its great petrochemical venture.

What of the future of Wilton? What are the prospects of a fourth olefine plant? ICI asserts there is no question at the moment of another cracker: a sound five-year forecast of petrochemical market demand is particularly difficult at present and without this no decision as to future construction is possible. In any case, the capacity of Wilton and Billingham plants to absorb olefine output is approaching satiety: any further expansion must first be mainly in plastics capacity.

It is felt safer to assume that the next cracker will be at Severnside, ICI's future petrochemical center on the Bristol Channel—still in the planning stage but where already capital expenditure of the order of £100 million is envisaged. Meanwhile, Wilton—where £100 million has been spent since 1949—will be considerably expanded in a number of directions. END



Plant for the manufacture of adipic acid at Hopewell, Va. Photo courtesy National Aniline Division.

Petrochemicals by liquid-phase oxidation of hydrocarbons: Part I

by Peter W. Sherwood*

THE USE OF AIR for partial oxidation of hydrocarbons has the obvious attractions of low-cost raw materials. It is not surprising, therefore, that partial oxidation processes are employed as a key step in petrochemical synthesis. As examples, we might cite partial oxidation of methane to produce acetylene, or synthesis gas (intermediate in the manufacture of ammonia, methanol, and Oxo alcohols).

Less drastic conditions of partial oidxation can be employed to synthesize organic compounds directly from the hydrocarbon raw materials. Among important processes of long standing in this category we include the direct conversion of ethylene to ethylene oxide, the production of phthalic and maleic anhydride from o-xylene and benzene, respectively, and the partial oxidation of propane-butane mixtures to yield a mixture of oxygenated chemicals, including acetaldehyde, acetone, methanol, formaldehyde, and other coproducts. In each of these processes, the conversion step is carried out in the vapor phase.

More recently, liquid-phase oxidation of hydrocarbons has gained in commercial importance. In general, liquid-phase conditions permit more accurate control over product distribution and they offer a means to adopt more highly selective catalysts. Perhaps, by today's standards, liquid-phase oxidation may be viewed as a more sophisticated type of chemical synthesis than its vapor-phase counterpart, and its main attraction is in the production of oxygenated compounds which are formed only with difficulty, or which are not sufficiently stable under the conditions that prevail at the higher temperatures or greater catalyst concentration of vapor-phase oxidation.

Illustrative of petrochemical products for which commercially important liquid-phase air oxidation processes have been developed are the following: acetic acid, cyclohexanol, phenol, terephthalic acid, C_{10}-C_{18} fatty acids, and acetaldehyde. As commercial ventures, all of these syntheses are developments of the last ten years, and all of them are in

*Chemical Engineer, White Plains, N. Y.

active competition with alternative methods for the production of the same derivative.

It is evident from this list that liquid-phase oxidation is making impressive headway in the petrochemical industries, and further significant developments along this line are now under way. It will be the purpose of the present article to discuss the main approaches which are involved in liquid-phase air oxidation processes of actual or potential commercial stature.

Mechanism of Liquid-Phase Oxidation. The reaction of hydrocarbons with air involves a chain mechanism in which one or several intermediate oxidation products serve as initiators. In liquid-phase oxidation of hydrocarbons, an incubation period is therefore quite generally observed. This period can be minimized by introducing reaction initiators such as hydroperoxides.

The overall reaction mechanism of liquid-phase autoxidation (i.e., oxidation by molecular oxygen) is divided into two main phases: formation of hydroperoxide, followed by decomposition of this intermediate product. In this sequence, the decomposition step may take several courses, depending on the hydrocarbon and the operating conditions involved. This step therefore determines the final oxidation products. Thus, Tipper[1] cites evidence that the decomposition reaction is of the second order with olefin hydroperoxides at 60-80 C, but of the first order with diphenylmethyl hydroperoxide at 105-115 C.

Less diverse is the character of hydroperoxide formation, for which the following mechanism is generally conceived:

(1) Initiation	→	radicals X,	
$X + RH$	→	$XH + R$	
(2) $R + O_2$	→	RO_2	Propagation
(3) $RO_2 + RH$	→	$ROOH + R$	Propagation
(4) $2RO_2$	→	inert products	termination
(5) $2R$	→	inert products	termination
(6) $R + RO_2$	→	inert products	termination

From this mechanism one may conclude that a high partial pressure of oxygen will favor reaction (2) and can be made to suppress almost completely the termination of the reaction chain in accordance with equations (5) and (6). Empirically, it is found that, after initiation, the rate of oxidation is a direct function of oxygen pressure—up to a point where the rate reaches an assymptotic maximum. The oxygen pressure at which this maximum rate of oxidation is observed depends on the hydrocarbon, the temperature, and the catalyst.

Thus, in autocatalytic oxidation of diphenylmethane at 115 C, maximum rate is reached at a partial pressure of oxygen of 425 mm. In the case of 2,6 dimethylhepta-2,5-diene at 25 C, the rate of this pressure is only 60% of maximum. Interestingly, the oxidation rate of hexadecene-1 at 45 C is almost completely independent of oxygen pressure.

As regards other variables, the rate is approximately proportional to hydrocarbon concentration and to the square root of catalyst concentration (or ultraviolet light intensity).

The Pampa, Texas, plant of Celanese Corp. of America produces acetic acid by air oxidation of butane in the liquid phase.

In aliphatic hydrocarbons, the point where molecular oxygen will attack first can be reasonably predicted on the basis of work by Voevelsky[2] and others. According to this work, molecular oxygen attacks, first of all, the center groups of the paraffinic chain. Isoparaffins undergo oxidation more readily than the corresponding normal paraffins. On the other hand, paraffins containing a quaternary carbon atom, such as 2, 2, 4-trimethyl pentane, exhibit a very high resistance of oxidation in the liquid phase.

In the aromatic series, toluene is considerably more resistant to liquid-phase oxidation than are its higher homologues. Despite its weaker carbon-hydrogen bond, moreover, toluene is more difficult to oxidize in the liquid-phase than are medium-range alkenes such as n-octane. This is an anomalous result because the radical R, equation (1), is formed by breaking the weakest C-H bond in the hydrocarbon. In the aliphatic series, the strengths of the different bond types are in this order: primary > secondary > tertiary > C-H $\propto$ to a double bond.

Decomposition of the hydroperoxide also takes place according to a chain mechanism. It may take several courses, and a detailed discussion is beyond this article's scope. From the industrial point of view, two main directions are of interest. One of these involves the splitting out of water from the hydroperoxide and an adjacent hydrogen atom, leading to alcohol and ketone formation. In the other mechanism, which occurs with *t*-alkoxy radicals, a C-C bond is split. The carbonium ion formed thereby reacts with water. The result is the formation of a ketone plus a hydroxyl compound. An example here is the industrially significant synthesis of phenol and acetone by decomposition of cumene hydroperoxide.

Industrially, liquid-phase hydrocarbon oxidations are carried out both catalytically and non-catalytically, and in the presence or absence of solvents. Insufficient theoretical work is known to permit generalizations on areas where the different approaches to autoxidation may be expected to be most useful. Instead, our discussion will therefore call attention to individual techniques which are commercially important in the execution of specific liquid-phase oxidation reactions.

A. Production of Cyclohexanol and Cyclohexanone. Cyclohexanol and cyclohexanone figure prominently in the synthesis of adipic acid, an intermediate in the production of nylon-66 (which accounts for 85% of adipic acid consumption) and the production of adipate plasticizers and urethane foams. While this is by far the principal market for cyclohexanol, other significant outlets exist in the textile industry where this alcohol serves as stabilizer and homogenizer for soap and synthetic detergent emulsions as well as for a variety of secondary uses (including dye solvent). Cyclohexanone, which is obtained by oxidation of cyclohexanol, finds growing significance as intermediate in caprolactam synthesis.

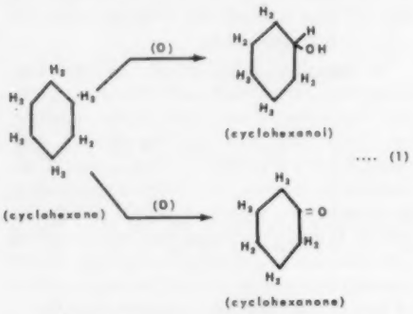
Both cyclohexanol and its oxidation product cyclohexanone find application as addi-

Close-up view of towers at adipic acid plant at Hopewell, Va. Courtesy National Aniline Division.

tives and co-solvents in the production of lacquers. Various uses as solvent and chemical intermediates round out the markets for these derivatives of cyclohexane.

A gauge to the rise in cyclohexanol consumption is found in the growth of adipic acid production which rose from 32 million lb. in 1948 to an estimated 320 million lb. in 1958.

Cyclohexanol is produced from cyclohexane by air oxidation in accordance with equation (1):



.... (1)

A variety of catalysts to promote this reaction have been mentioned in the patent literature. Of these, cobalt naphthenate appears to be the most effective, and is commonly employed in this operation.

The reaction normally has a very long incubation period. This may be overcome by the use of an initiator. A number of organic peroxides, per acids, and ketones can serve usefully in this function. Cyclohexanone (itself one of the reaction products may, however, be used as initiator without the introduction of impurities to complicate the purification problem.

The oxidation product is primarily a mixture of cyclohexanol and cyclohexanone. No method has become known to carry out the reaction to the substantial exclusion of one or the other of these products. Therefore, if cyclohexanol alone is the desired product, it is necessary to reduce contained cyclohexanone by catalytic hydrogenation, while the pure ketone must be produced by oxidation of cyclohexanol.

However, for the production of adipic acid which is, after all, the principal purpose of most cyclohexane oxidation, the mixture of cyclohexanol and cyclohexanone serves as satisfactory starting point, so that isolation of either chemical is not required.

The original process for the partial oxidation of cyclohexane to its alcohol, and ketone derivatives is due to Loder.[3] In this synthesis, the operation is carried out at atmospheric pressure as well. However, the reaction rate is too low at such conditions to permit economical exploitation of the process.

Operating temperature is in the range of 120-170 C. Above this temperature, the reaction may actually be carried out in the absence of an oxidation initiator. However, high-temperature operation results in excessive yield losses due to over-oxidation of the products.

In a typical experiment, 1008 grams of cyclohexane, 3.0 grams cyclohexanone, and 0.5 grams cobalt naphthenate were charged to a stirred autoclave. The mixture was heated to 145 C under a pressure of 350 psi and air was bubbled through the mixture for 113 minutes. The liquid product contained 871 grams cyclohexane, and 148 grams of cyclohexanol plus cyclohexanone.

An important feature of this process is the use of low conversion rates per pass. As the allowed degree of oxidation is increased, yield drops due to the formation of higher oxidation products. Furthermore, reaction rate drops as the degree of oxidation progresses, and oxygen absorption eventually becomes negligible.

Actually, the original version of the process was found to be unsuitable for plant operation. Laboratory results had indicated a yield of useful products in the range of 85-95% when per/pass conversion was held below 5%. At about 10% conversion, the laboratory still showed 60-95% yield. It was found impossible to reproduce these results in prolonged operation of the commercial plant which did not attain yields in excess of 70% at a conversion of 10% per pass.

The difficulty was traced to the eventual accumulation of benzene and other hydrocarbons in the recycle cyclohexane, as well as to the presence of sulfur in the feedstock. It was furthermore found that improved yields could be obtained by removing the water of reaction as it is formed.

A significant contribution to cyclohexane oxidation was made by Hamblet and Chance,[4] who were able to obtain considerable improvement in oxidation performance by removing water, as well as hydrocarbon impurities, azeotropically during the reaction progress.

This approach makes it feasible to employ as feedstock a petroleum-derived cyclohexane that contains not only some sulfur but also benzene in a concentration of several tenths of a percent together with close-boiling aliphatic and naphthenic hydrocarbons. These materials, if accumulated in the recycle stream, interfere with the oxidation reaction.

Liquid-phase oxidation of cyclohexane by this method is carried out continuously. The process stream flows through a series of stirred autoclaves. Each autoclave is equipped with an overhead reflux condenser, provided with means of water withdrawal. Air enters the bottom of each autoclave.

Effluent from the final reaction stage is steam-distilled for the overhead removal of hydrocarbons. The bottoms are the desired crude oxidation product. The overhead is water-washed and then subjected to azeotropic distillation for overhead removal of benzene and other hydrocarbon contaminants. Cyclohexane, recovered as bottoms product, is recycled to the first oxidizer stage.

At reasonably low conversion, the product of cyclohexane oxidation is predominantly cyclohexanol and cyclohexanone. At 15-20% conversion in the presence of cobalt naphthenate as catalyst, the alcohol makes up 30-50% of the cyclohexane-free oxidation product.

Several minor side reactions occur in the oxidation step. About one percent CO_2 is found in the tail gases. The aqueous layer is separated from the oxidation products containing organic acids (60% formic, the rest mainly acetic acid). Numerous higher oxidation products have been identified in the organic layer. Among them, adipic acid is the only one present in significant amounts, and its formation rises rapidly with increasing conversion per pass.

B. Production of Acetic Acid. Acetic acid, together with its anhydride, is by far the most important of aliphatic acids, with the following 1958 production volume in the United States: acetic acid (synthetic), 554 million lb; acetic anhydride, 938 million lb.

The bulk of acetic acid serves as intermediate in the manufacture of acetic anhydride.

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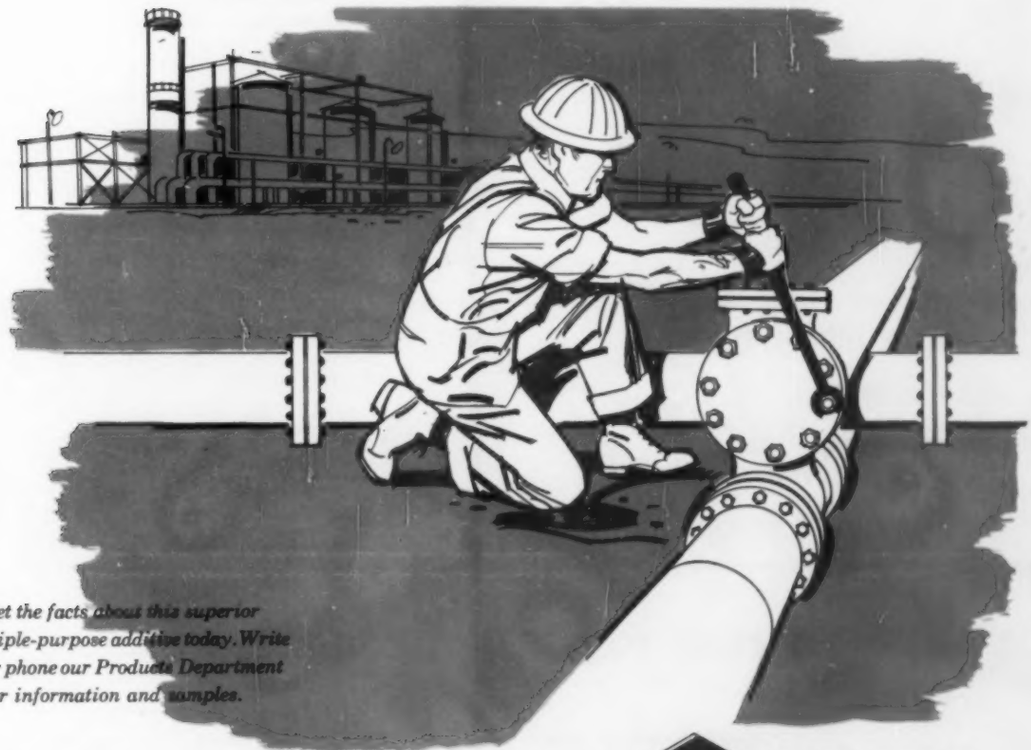

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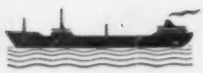

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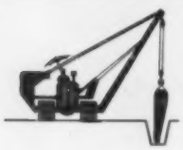

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This is a product which depends almost completely on the market for cellulose acetate which accounts for some 95% of total consumption. Other uses for the anhydride include the production of acetyl salicylic acid (aspirin), acetanilide and the plasticizers, triacetic and acetyl ricinoleates, as well as various minor derivatives.

Overall, it has been estimated that 60% of acetic acid output is consumed in the production of cellulose acetate flakes; 30% goes to the production of acetate esters, and the balance is taken up by applications in textile processing and by the production of metallic acetates, rubber chemicals, etc.

All but about 3% of acetic acid output is obtained by synthetic means. Biggest factor in this field is the partial oxidation of acetaldehyde. Two other processes serve as commercial sources of synthetic acetic acid in the United States: (1) non-catalytic vapor-phase oxidation of a butane-propane fraction, as practiced by Celanese Corp. (at Bishop, Texas) and Gulf Oil Corp. (at Monroe, Texas); and (2) catalytic liquid-phase oxidation of butane, as practiced by Celanese Corp. (at Pampa, Texas).

In the vapor-phase process, a highly complex and difficulty separable mixture of oxygenated chemicals is obtained. The predominant products are acetaldehyde, formaldehyde and methyl alcohol. Acetic acid is formed only as one of a number of co-products; its yield is of the order of 0.3 lb/gal of feed hydrocarbon.

By contrast, the liquid-phase oxidation of butane can be made highly selective with respect to acetic acid formation. Yield as high as 4.66 lb acetic acid per gallon of butane has been reported. Variation in operating conditions permits preferential formation of ketones as esters, but this latter approach has not found commercial adoption.

The liquid-phase oxidation of butane to acetic acid may be carried out either catalytically or non-catalytically. The former approach is employed commercially. Numerous catalysts may serve for the desired selective conversion, including oil-soluble salts of cobalt, cerium, chromium, and bismuth.

Particularly high yields are reported for the latter two catalysts in patents assigned to Celanese Corp. Thus, the use of bismuth acetate as catalyst in the liquid-phase oxidation of butane at 815 psia and 168 C is reported to yield 4.66 lb acetic acid per gallon of feed hydrocarbon in a single pass. Formation of highly corrosive formic acid is reported[5] to be limited to 0.06 lb/gal of butane.

A process for the oxidation of butane to acetic acid in the presence of chromium acetate catalyst has been reported by Mitchell and Luke.[6] In this process, acetic acid is used as solvent, and only limited conversion is taken per pass, making it necessary to recycle unconverted hydrocarbon after separation from the products. This use of acetic acid as solvent and of recycle operation contributes to the selectiveness of butane conversion to acetic acid (cf. also Refs. 7 and 8).

The oxidation is carried out in continuous operation. Vertical cylindrical reactors are employed; air is introduced through spargers at the converters' bottom at a rate controlled to effect essentially complete conversion of oxygen. Operation is at temperatures in the range 125 to 225 C and at a pressure above 200 psi.

As the reaction proceeds, a mixture of water of reaction, the oxygenated organic compounds formed, inert gases and unreacted hydrocarbon distills overhead. This stream is cooled for the recovery of condensible components. The liquid formed thereby settles into two phases—a hydrocarbon layer which is returned to the oxidation zone, and an aqueous layer which is worked up for recovery of contained acetic acid and other oxygenated products.

The crude recovered product contains various esters, ketones and alcohols in addition to acetic acid and unconverted hydrocarbons. These oxygenated materials constitute an intermediate stage in the oxidation chain. They may be recycled to the reactor for conversion to acetic acid in a subsequent pass, or they may be recovered in the purification train as saleable product.

Mitchell and Luke propose a simple solvent extraction step for the crude product to control the amount of lower oxygenated products which is recycled to the reactors—and thus to control the ratio of acetic acid to ketones, esters and alcohols. If acetic acid alone is the desired product, the aqueous layer recovered from the reactor overhead is washed with fresh hydrocarbon stream en route to the converter. Conversely, a water wash is provided for the hydrocarbon layer of the product condensate if recovery of lower oxygenated chemicals is intended. In the latter case, the water washings are combined with the aqueous phase of the crude product condensate and the joint stream is taken to the recovery stage.

In an example, 1300 parts of weight of glacial acetic acid containing 0.3 wt-% chromium acetate is charged to a stainless steel reactor. First, liquid n-butane is introduced to the system at about 3.5 weight parts per minute and air is introduced through a sparger at the rate of 16.35 weight parts per minute. The pressure is maintained at 815 psi and the temperature of the exothermic reaction system is held at 165 C. At these conditions, the oxygen introduced to the reactor is completely consumed.

The overhead vapors are cooled to 5 C, and the condensate is allowed to stratify. The hydrocarbon phase is recycled to the reactor at a rate of about 250 parts per minute. The aqueous layer is continuously withdrawn and is worked up by distillative means. By this mode of operation, 100 lb of n-butane will show an ultimate yield of 103.7 lb acetic acid, 6.37 lb methyl acetate, 2.38 lb ethyl acetate, 1.03 lb alcohol, and 4.53 lb methyl ethyl ketone.

As pointed out above, an increase in the formation of esters and ketones—with a corresponding decrease in acetic acid production—can be achieved by washing the recycle hydrocarbon stream with as little as one wt-% water. If such an approach is taken, at otherwise unchanged conditions, 100 lb of n-butane converted will yield 79.2 lb acetic acid, 12.6 lb methyl acetate, 7.2 lb ethyl acetate and 6.5 lb methyl ethyl ketone.

A process employing more complete recycle in the liquid-phase oxidation of n-butane to acetic acid has been developed by England's Distillers Co.[9] In this approach, operating temperature is between 160 and 200 C; a lower temperature will not permit sufficiently complete oxidation while operation above 200 C results in excessive loss due to overoxidation. Operating pressure is controlled by the need to maintain a liquid phase; e.g., at 170-175 C, the reaction is carried out at 600 psig.

Again, only partial conversion per pass is taken. The hydrocarbon layer recovered from the crude product condensate is recycled directly. Furthermore, recycle is provided for the portion of the water layer which can be steam-distilled below 99 C. This fraction contains most of the lower oxygenated aliphatics and their return to the converter permits their further oxidation to aliphatic acids, especially to acetic acid.

Two critical variables in the process are the weight ratio of oxygen feed to total hydrocarbon stream (both recycle and make-up), which should be less than 0.5, and the ratio of make-up butane to recycle hydrocarbon.

The oxidation step itself may be carried out non-catalytically or in the presence of the oil-soluble salts of ambivalent heavy metals (e.g., Co, Mn, V) which are known catalysts for this type of reaction. In an example of non-catalytic operation, Armstrong[9] employed a hydrocarbon feed rate of 485 g/hour, a recycle distillate rate of 400 g/hr. and an oxygen uptake rate of 672 g/hr. at 170-175 C and 600 psig. Operating with recycle from both of the phases obtained from the reactor effluent, as described above, the product consisted of a mixture of C_1-C_4 acid. It contained 74.3% acetic acid.

In this type of oxidation reaction, highly corrosive conditions occur due to the simultaneous presence of water and the lower aliphatic acids in the liquid phase. Principal offender is formic acid. By using techniques such as those outlined above, in which formic acid concentration is held to extremely low values, it is possible to carry out the reaction in stainless steel of the nominal composition: 18% Cr, 8.5% Ni, 0.5% Ti.

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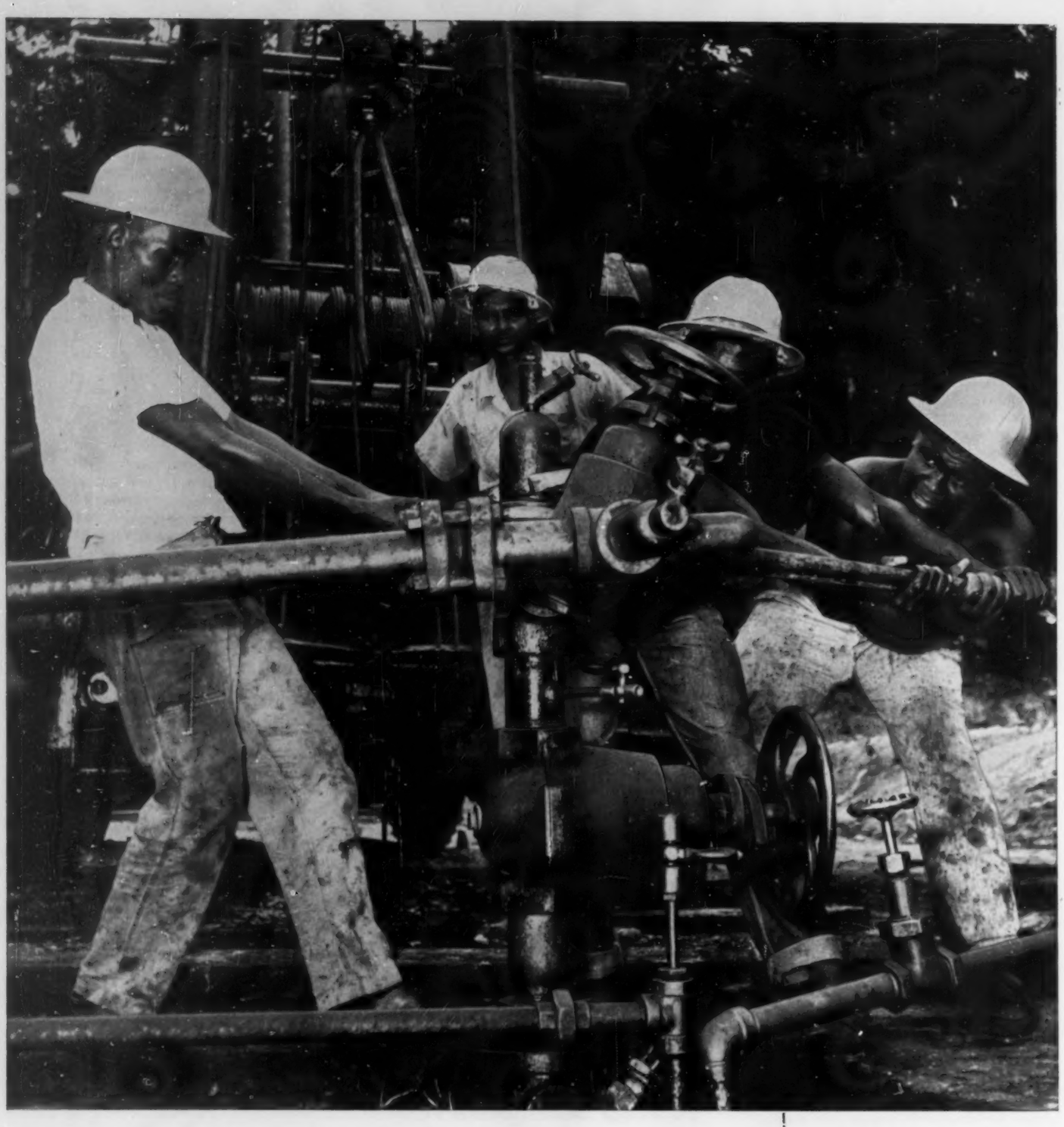

Trinidad. A production crew carry out service on a wellhead assembly. British Petroleum has a 77% interest in the Trinidad Petroleum Development Company Limited, which last year produced nearly three-quarters of a million tons of oil.

BP

Laying Britain's longest pipeline

Strung out across the Welsh countryside are some pipe lengths ready for laying — a part of British Petroleum's 60-mile crude line from Angle Bay to Llandarcy.

In Britain The British Petroleum Co. has operated since 1951 the only major crude oil pipeline—from Finnart on Scotland's west coast to Grangemouth Refinery on the Firth of Forth. Now BP is laying Britain's longest crude oil line which will stretch 60 miles across South Wales from Angle Bay on the south-west tip of Wales to Llandarcy Refinery, near Swansea.

Rivers, roads and railways are proving no hindrance to the laying of this 18 in. diameter pipe. By the end of 1959, about 15 months after work started, all the pipe should be welded together, laid underground and ready for testing with water.

With the completion in July this year at Angle Bay, of a new tanker terminal capable of berthing two of the biggest tankers envisaged, oil will start flowing through the new pipeline, which will have a capacity of 5,000,000 tons a year.

Like a small army, the 600 men at present engaged on laying the pipeline are moving steadily across Wales. Spread out along a strip of open country 40 ft wide and some five miles long, with all types of mechanical equipment, including 50 vehicles ranging from Land Rovers to heavy trucks, the whole "main spread" is moving forward about half a mile a day.

This forward movement is carried out to an ordered sequence: the 40 ft wide working strip is cleared of all obstructions, such as trees, hedges and fences, and in agricultural land the top 12 in. of soil is stripped and piled ready for replacing after the pipelaying has been completed. The 25-ft. lengths of steel pipe, wrapped with glass fiber and bituminous enamel, are then laid out along the route. Nearly 13,000 of these pipe lengths were delivered by road into dumps placed at approximately one mile intervals along the route.

The next operation in the sequence is the pivot point of the spread, a team of eight welders, craftsmen who can weld more than 100 18 in. diameter butt welds a day when they hit their stride. This teams sets the pace by pushing the "front end" and keeping the "back end" in pursuit.

The "back end" are responsible for testing the pipe welds by using radioactive isotopes, completing the wrapping of the pipe at the joints, excavating a trench into which the pipe is lowered and reinstating the ground to its former condition.

No bends were ordered and where necessary the pipes are being curved on site on a special pipe bending machine. About 600 bends will be required.

The operation is by no means as simple as it sounds as the pipeline route contains many difficult sections which would delay the progress of the main spread. Before pipe-laying commenced a planning survey was carried out and from the information obtained it was decided that all natural and man-made obstacles would be crossed prior to the start of work on the main spread.

The obstacles were of many types, including 12 major and nearly 100 minor roads, 12 rail crossings, a canal, three underground aqueducts and several main gas lines. Concrete culverts were placed under most of these obstructions.

Presenting the most difficulty were four major rivers, five minor rivers and 28 streams. Ten of the minor rivers and streams run in steep sided ravines. In one ravine a shelf about 700 yards long had to be excavated in the hillside to accommodate the pipe and working space alongside.

To complicate matters, at two of the river crossings the river wall formed part of the side of a rail embankment. One of these, the River Towy, is fast flowing and tidal and at the site of the crossing is 400 ft wide and 27 ft deep. The eastern bank is bounded by a main line double railway track.

The pipe to be laid beneath the river was 430 ft long and with its concrete coating weighed 45 tons. First, a trench to contain the pipe had to be dug to a depth of between five and 12 ft below the level of the river bed. This was eventually accomplished by using a dragline operating from a pontoon. At the same time a 36 in. culvert was positioned beneath the railway tracks.

After many difficulties had been overcome, including the river flooding and depositing the whole length of pipe some distance up-stream, the pipeline was towed across the river by pontoon. But high tides and the fast running river had partly refilled the underwater trench and the pipe would not sit down where it should. It was only after the pipe has been "loaded" with water, 40 tons of concrete in oil drums attached to it, and the silt in the trench dispersed by jetting with a combination of compressed air and water, that the crossing was finally accomplished.

However, the route runs generally through dairy farming country with much grassland and few cultivated fields. The line crosses some short lengths of bog, but the ground is mainly heavy boulder clay, with rocks outcropping at the tops of hills and occasionally in stream beds.

Inhabited buildings are avoided but in two places the route crosses plots scheduled for housing development. In these cases the pipe is being laid through gaps between the proposed houses and will be protected by concrete slabs.

The pipeline will have only one main pumping station, which will be sited near the storage tanks at the tanker terminal. No booster pumping stations will be needed along the route. In the pumping station there will be four electrically operated centrifugal pumps. With the present planned throughput it will not be necessary to use more than three of these pumps, with a total capacity of 2,760 gpm, at any one time to pump the oil to Llandarcy Refinery.

The highest elevation the pipe will reach is 676 ft above sea level, just over 42 miles from Angle Bay. A control valve will be fitted at Llandarcy Refinery to maintain presure at this high point. An automatic control valve will also be installed at the pumping station to prevent pressure surges when stopping the pumps.

Scraper traps will be installed at each of the line. To permit the use of go-devils the minimum radius for any bend will be 18 ft.

External corrosion of the pipe is not expected to be a significant factor for a number of years. Magnesium anodes are being installed in areas of low soil resistivity and at some river crossings and about 200 connection posts will be attached to the pipeline for cathodic protection at selected points along its route. After construction and consolidation of the earth around the pipeline, comprehensive testing will be carried out to determine the final form that a cathodic protection scheme should take.

Private telephone lines are to be installed between Angle Bay and Llandarcy Refinery to facilitate control of the pipeline. END

Guests of Rotterdam-Rhine Pipeline Company inspect lower-in operations in Germany after watching the tie-in weld made at the Netherlands-German border near Venlo. Photo courtesy Bechtel Corp.

Europe's pipeline network

Europe is expanding its pipeline network rapidly as energy use rises and oil's share increases. Two big projects have occupied the center of the stage, only one of them European but both bearing on Europe's oil. The Algerian line from Hassi Messaoud to the coast at Bougie is complete now and will soon begin operations. The major line in Germany, 28 inches in diameter, from Wilhelmshaven port to Wesseling in the Ruhr Valley is now being completed and will carry crude to major new refineries owned by the pipeliners themselves

The accompanying table, based on OEEC data, shows one of the biggest projects in Europe although that project is still in the nebulous state known as "planning." It is a major crude line owned by about 19 companies, which will run from the south of France, probably Marseilles port, through the industrial heart of Europe, the manufacturing regions of France and Germany. Present plans call for use of Lavera Port, near Marseilles.

EUROPEAN AND NORTH AFRICAN PIPE LINES

Owner and/or Operator	Route (From-To)	Completion (Date)	Length (Miles	Diam. (Inches)	Capacity (1,000 b/d)	Annual Throughput (1,000 Bbl.)	Commodity Carried
ALGERIA:							
SOPEC (Compagnie Francaise des Petroles and S.N. REPAL)	Hassi Messaoud-Bougie	Oct. '59	387	24	—	29,200[1]	Crude
AUSTRIA							
Soviet Mineral Oil Administration	Zistersdorf-Labou	—	31	12	—	—	Crude
BELGIUM:							
Distrigaz Cy-Brussels	Esso Antwerp refinery—Societe d'Electricite de l'Escaut-Marxem (Antwerp Suburb)	—	6.2	14	—	—	Refinery, Dry Gas
FRANCE:							
Esso Standard S.A.F.	Le Havre-Port Jerome	1933	2.9 22.4	8 10	52.8	69,600[2]	Crude
Esso Standard S.A.F.	Abalso-Port Jerome	1951	19.5	10	408		

Owner and/or Operator	Route (From-To)	Completion (Date)	Length (Miles)	Diam. (Inches)	Capacity (1,000 b/d)	Annual Throughput (1,000 Bbl.)	Commodity Carried
Shell Berre	Le Havre-Petit Couronne	1952	47	14	60	39,340	Crude
Cie Francaise de Raffinage	Le Havre-Gonfreville	1949	6.25	16	105.6	64,750	Crude
Shell Berre	Lavera-Berre	1950	20	14	75.6	74,740	Crude
Cie Francaise de Raffinage	Lavera-La Mede	1952	7	16	105.6	60,700	Crude
Marseilles Chamber of Commerce	Sea-line at Lavera	1952	1.25	14	144	57,100	Crude
Socony Vacuum Francaise	Sea-line at Frontignan	1948	2.13	12	108	21,690	Crude
Cie Francaise de Raffinage	Gonfreville-LeHavre	1933	6.25 6.25	8 10	52.8 63.6	5,000	Products
Cie Francaise de Raffinage	La Mede-Garonte	—	5 5	12 12	45.6 45.6		
Socony Vacuum Francaise	Frontignan-Sete	Before W.W.II	4.63 4.63 4.13 0.6	8 8 10 8	18 to 24	—	Products
Regie Autonome des Petroles	St. Marcet fields to Pau, Tarbes, Toulouse, Montauban, and Agen, Bordeaux	1942	509	6 to 10	60 to 135.8	9,740	Gas
Gaz de France	Sarreguemines Metz-Paris	1954	194	12	39	—	Gas
Socony Vacuum Francaise	Frontignan-Sete	Sept. '55	4	6	—	—	Gas
Gaz de France	Ambes-Bordeaux	Oct. '55	12	8	—	—	Gas
Trapil (Societe des Transports Petroliers par Pipe Lines)	Le Havre-Paris	Apr. '53	150	10	34.8	12,911	Products
Esso Rep	Parenti -Ambes	Apr. '58	60	12	—	12,045 to 20,440[2]	Crude
S.E.P.L. (Societe du Pipe-Line Sud-European)	Lavera-Karlsruhe, Strasbourg	Jan. '63	475	30	200 to 400	73,000[4]	Crude
GERMANY:							
Deutsche Schachtbau & Tiefbohr G.m.b.H.	Lingen-Osterbrook on Dortmund (Ems Canal)	—	6	6	13.5	—	Crude
Deutsche Schachtbau & Tiefbohr G.m.b.H. and Gewerkschaft Elwerath	Ruehlemoor-Lingen	—	6	6	—	—	Crude
Emsland-Erdoelleitung (C. Dielmann Bergbau G.m.b.H.; Gewerkschaft Elwerath; Preussag, Wintershall, A.G.)	Ruehlertwist-Osterwald (R.R.)	—	11	5	1.95	—	Crude
Erdoelbetrieb Reitbrook (Soc. Vac. and Presassagg)	Reitbrook-Warwisch (Elbe River)	—	5 5	6 8	—	—	Crude
Preussag	Georgsdorf-Veldhausen (R.R.)	—	4 4	4 4	—	—	Crude
Wintershall A.G.	Emlichheim-Emlichheim (R.R.)	—	2.5	6	102.8	—	Crude
Deutsche Vacuum Oel A.G. & Gewerkschaft Brigitta	Suderbruch-Gilton (R.R.)	—	4	6	--	—	Crude
Niedersaechsische Oelleitungs G.m.b.H.	Hohne-Beedenbestel (R.R.)	—	8	4	—	—	Crude
Nord-West Oelleitungs G.m.b.H. Shareholders: Esso A.G. 47.2%; B.P. 26.3%; Ruhrbau 8.3%; Scholven-Chemie 7.7%; Union Rheinische 6.8%; Ruhrchemie 3.7%	Wilhelmshaven-Wesseling Ruhr	Late 1958	242	28	—	65,700[4]	Crude
D.E.A.	Brunsbuttelkoog-Hemmingstadt	1953	22	6	—	—	Crude
D.E.A. (Vacuum and Preaubag)	Boostedt-Klein Kummerfield	—	2.5	6	—	—	Crude
Brigitta and Vacuum	Hemmelte-West-Bartmannsholte	—	3.7	6	--	—	Crude
Brigitta	Steimbke-Hagen	—	12	6	—	—	Crude
E.E.G.	Scheehorn-Osterwald	—	2	4	—	—	Crude
E.E.G.	Osterwald-Lingen-Holsthausen	—	14	5	—	—	Crude
HAFAG (Duisburg-Ruhrorter Hafen A.G.)	Duisburg-Ruhrort-Oberhausen	—	8	6	—	—	Crude
HAFAG (Duisburg-Ruhrorter Hafen A.G.)	Duisburg-Ruhrort-Gelsenkirchen	—	18	8	—	—	Crude
HAFAG (Duisburg-Ruhrorter Hafen A.G.)	Gelsenkirchen-Gelsenkirchen-Buer and, Gelsenkirchen-Horst	—	2	8	--	—	Crude
D.E.A. (Deutsche Erdol A.G.)	Hemmingstedt-Brunsbuttelkoog	1953	22	5	—	—	Liquid Fuel
E.E.G.	Frenswegen-Georgsdorf	—	6	3	—	—	Natural Gas
E.E.G.	Georgsdorf-Scheerhorn	—	3	3	—	—	Natural Gas
E.E.G.	Itterbeck-Halle-Frenswegen	1953	7	5	—	—	Natural Gas
E.E.G.	Frenswegen-Nordhorn/Bentheim	1953	12	8	—	—	Natural Gas
Wintershall	Frenswegen-Nordhorn	—	2.5	2.5	—	—	Natural Gas
Deilmann	Bentheim-Huels	—	48	8	--	—	Natural Gas
ITALY:							
Sarpom (Caltex 50%; Fiat 50%)	Savona-Trecate	1952	90	8	19	3,000[5]	Crude
Condor	Genoa-Rho	1953	80	12	46.8	14,600[6]	Crude
Societa Petrolifera Italiana	Vallezza-Fornova	—	4.6	3	2.0	—	Crude
INPET (Societa per l'Industria Italiana del Petrolia)—Shell	La Spezia-Harbour	—	1.5	2 at 12 1 at 8 1 at 6	—	—	Crude and Products
E.N.I. (Italian State Oil Company)	Genoa-Switzerland	Approx. 1962	260	20 to 28	—	15,000[6]	Crude
MOROCCO:							
Societe Cherifienne des Petroles	Bou Draa-Petitjean	—	1	2	0.28	—	Crude
Societe Cherifienne des Petroles	Tselfat-Petitjean	—	12	2	0.28	—	Crude
Societe Cherifienne des Petroles	Aim Hamra-Karia (R.R.)	—	2	2	0.15	—	Crude
NETHERLANDS:							
Shell	Pernis-Vlaardingen	1950	1	6 at 6	5.25	1,500	Products
R.R.P. (N.V. Rotterdam-Rijn Pijpleiding Maatschappij)—Shell/Caltex/Gelsenberg	Rotterdam-Wesseling/Godorf	July '60	193	24	—	54,750[4]	Crude

(1) Initially; expected throughput by 1962—102,200,000 bbl/yr.
(2) Includes 59,180,000 bbls for Esso S.A.F. and 10,420,000 bbls for Socony Vacuum.
(3) Anticipated throughput.
(4) Initially; ultimate throughput will be 146,000,000 bbl/yr.
(5) Actual figure; anticipated throughput—7,300,000 bbl/yr.
(6) Anticipated throughput.

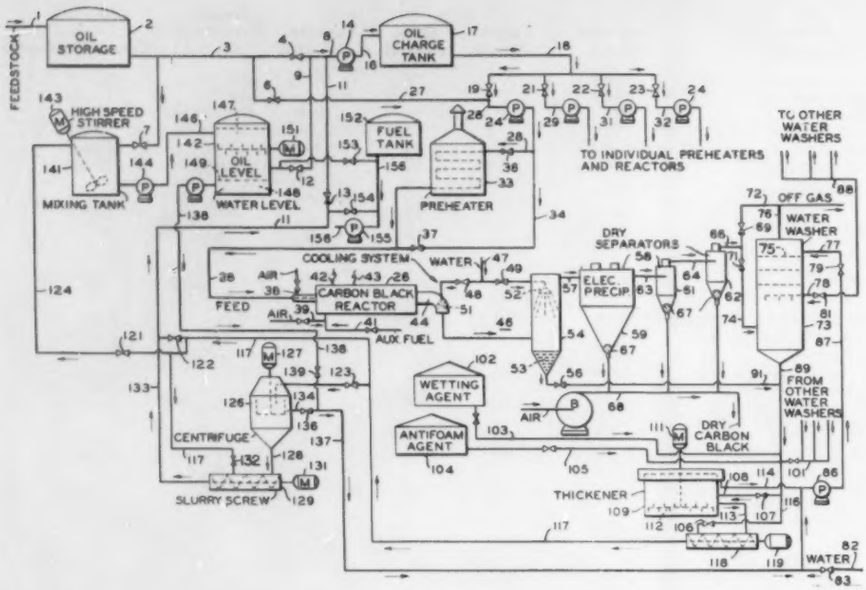

Fig. 1—Furnace black system in which water spray is used to cool the effluent after dry separation of most of the black. USA Patent 2,867,508, to J. Q. Wood et al.

Review of recent USA patents on manufacture of carbon black

by Heinz Heinemann and Harold Shalit

THIS REVIEW discusses those patents dealing with carbon black, its production and use. This important material finds its greatest use as a rubber additive, but it also has large scale uses for ink colorants and grease preparation. The importance of carbon black is reflected in the large production figures;* for 1958 in the USA there were produced over 1.644 billion lbs of carbon black, divided between the furnace process, 1.320 billion, and the channel process, 0.324 billion. For this production, there were used 211,048 MM cuft of natural gas and 231,057,000 gals. of liquid hydrocarbons.

An attempt has been made in this article to discuss patents which appeared to be representative of the fields of greatest interest. This is not intended to be a complete compilation of all the patents on carbon black for the period covered, 1954 to the present. Most of the patents in this review are from the period 1956 to the early part of 1959.

Most of the patents reviewed here are concerned with the *furnace process* for carbon black. In this process thermal cracking of a hydrocarbon charge takes place in a single or multiple chambered furnace either by combustion of a part of the charge material or of a fuel gas. The cracking is induced by radiant energy and by direct mixing of the hot flue gases with charge.

In *2,794,710, S. D. Lawson of Phillips Petroleum Co.* discloses a method of feed preparation for furnace blacks when aromatic extracts of catalytic cycle oils are used as charge. The cycle oil is distilled into three cuts. The intermediate cut is charged to a small furnace, the other two to a large furnace. It is claimed that slagging of the small furnace refractory lining is thereby prevented.

FURNACE DESIGN

In the following section various design modifications of the carbon black furnaces are discussed. *H. A. Braendle (2,735,753 to the Columbian Carbon Co.)* discloses a method of rapidly and uniformly mixing the charge stream and hot combustion gases. The same end is accomplished by *G. L. Heller of Columbian Carbon Co. in 2,769,692.* In *2,780,529 (F. K. Wrigley to Phillips Petroleum Co.)* a burner is described for introducing the fuel and oxidant tangentially into the combustion section of the furnace. *N. C. Miller (2,781,250 to Phillips)* suggests a burner nozzle design for the combustion section. From the same company, *H. A. Larson and W. H. Rushford (2,785,053)* patent an arrangement of heating elements and furnace components in order to produce increased yields of carbon black.

High abrasion carbon black is the product of an arrangement of furnace heating elements patented by *C. F. Bethea, L. W. Pollock, and J. Q. Wood* of *Phillips in 2,785,054. W. D. Peters of Phillips (2,800,394)* describes a method of controlling the air-to-oil ratio of furnaces. This ratio is dependent on the Bureau of Mines Correlation Index which Peters has found is directly related to the dielectric properties of the oil. It is thus possible to control the furnace by measuring the dielectric constant of the charge oil.

In order to provide for even burning of the fuel gas-air mixture around the oil inlet, *E. D. Campbell and G. F. Friauf (2,801,157 to Godfrey L. Cabot, Inc.)* suggest that the fuel gas be injected into the axis of the burning mixture through a ring of jets located around this axis. *O. K. Austin of Phillips in 2,852,346* suggests providing the furnace with a refractory lining to direct the tangentially traveling combustion gases

* Taken from Bureau of Mines Minerals Yearbook for 1958—*Carbon Black* by I. V. Avery, L. V. Harvey.

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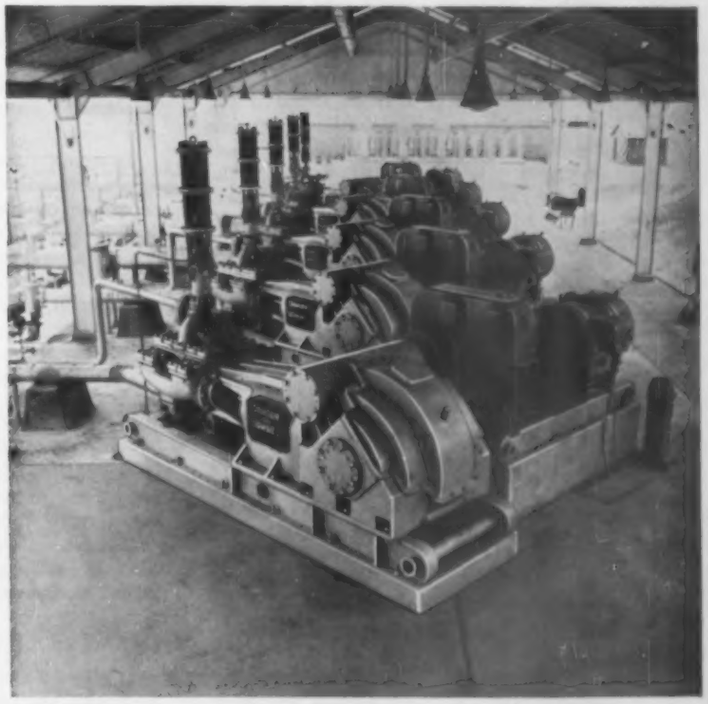

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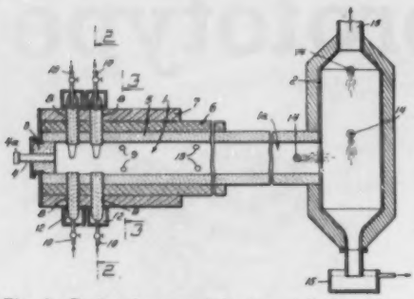

Fig. 2—Device for post injection of hydrocarbon charge to a furnace black type of furnace. Primary injection ports are at 9; post injection ports are at 13. USA Patent 2,768,067, to G. L. Heller.

into a helical path around the furnace thus increasing the heating surface. A dual fluid injector for carbon black furnaces is described by *L. G. Nannini (2,864,673 to Phillips)*. *J. C. Krejci of Phillips in 2,865,717* claims to produce a better carbon black by incorporating a choke or orifice in the inlet of the reactor after the precombustion section.

A somewhat different furnace design is patented by *E. A. Erickson (2,885,269 to Commercial Solvents Corp.)* who describes a refractory furnace divided into two chambers by a partition which has at least one port. On one side of the partition is a heating chamber which reflects radiant heat into the other side, the cracking chamber. Means are provided for keeping the hot combustion gases from the cracking hydrocarbons.

FURNACE OPERATION

In the following section will be considered those patents having to do with methods of operating furnace black furnaces.

G. L. Heller (2,768,067 to Columbian Carbon Co.) proposes post injection of the hydrocarbon charge after the initial mixing of hydrocarbons and combustion gases (see Fig. 2.). It is claimed that such a procedure insures total use of the oxygen in the burning gases. A somewhat different procedure is advocated by *R. Antonsen of Godfrey L. Cabot (2,773,744)* who thermally dissociates hydrocarbon gases with hot hydrogen in an unobstructed reaction zone. Carbon black and hydrogen are produced, the carbon black separated, and part of the hydrogen is reheated and recycled. According to *C. W. Sweitzer (2,779,664 to Columbian Carbon Co.)*, the surface properties of furnace carbon blacks can be altered by mixing an oxygen containing gas with the suspension of carbon black in hot combustion gases. The amount of oxygen used should be 0.5-3% by volume at 1200-2200F. In *2,781,246 (W. A. Goldtrap to Phillips Petroleum Co.)* proposes to separate a major portion of the carbon black from the combustion gases by a dry process. The remaining black is washed out with charge oil, such washings being used as feed to the pyrolysis. Heat is thus conserved and large numbers of carbon black nuclei are provided for the pyrolysis.

An improvement in furnace operation occurs according to *J. C. Krejci (2,781,247 to Phillips)* if an additional hydrocarbon is introduced radially into the tangentially moving combustion gases downstream from the point of formation of the combustion gases. Occasionally the oil injection nozzles of furnaces become clogged with carbon; *H. A. Larson of Phillips in 2,809,098* suggests cleaning such nozzles by first cutting off the oil supply and then injecting oxygen or air through the nozzle to burn out the coke deposit.

In *2,829,951 (E. Wagner and F. Endter of Deutsche Gold- und Silber Scheideanstalt)* furnace blacks are made by homogeneously mixing hydrocarbon gas, fuel gas, and oxygen. The mixture is then conducted through a flow stabilizing zone to produce laminar flow; the flow stabilized stream is then burned in a flame having a high volume-to-area ratio. According to *G. L. Heller (2,782,101 to Columbian Carbon Co.)* in furnaces where "make" hydrocarbon is introduced radially into swirling hot combustion gases, it is desirable to have all the oxygen in the combustion gases consumed before the introduction of the "make" gases for maximum production of carbon black. This is accomplished by injecting, prior to the injection of make gas, a normally gaseous reducing agent into the combustion gases, e.g., hydrogen or natural gas. In *2,813,009 by W. C. Ekholm and G. L. Heller (to Columbian Carbon Co.)* carbon black is made from liquid hydrocarbons. Their process comprises first thermally decomposing the liquid by subjecting it to radiant energy from the combustion of a fuel gas. The pyrolyzed hydrocarbons are then subjected to partial combustion to form a gaseous suspension of carbon black. *W. H. Rushford (2,852,345 to Phillips Petroleum Co.)* proposes to maintain hydrocarbon inlet ports of furnaces free of carbonaceous deposits by introducing some hydrogen at this point.

In some furnace black systems water sprays are used to cool the effluent after dry separation of most of the black. This results in a water slurry of carbon black. According to *J. Q. Wood and L. W. Pollock (2,867,508 to Phillips Petroleum Co.)* this slurry is at least partly dewatered, mixed with hydrocarbon liquid, and recycled to the pyrochemical conversion step. Such a procedure results in improved yields (see Fig. 1.). An improvement in effluent cooling is proposed in *2,873,172 (R. W. Leslie and G. P. Jennings to Phillips Petroleum Co.)*. The improvement comprises first cooling the effluent by indirect heat exchange with liquid water followed by direct heat exchange with a water spray. The result is a reduction in the amount of water ending up in the product stream.

CARBON BLACK RECOVERY

The last two patents discussed dealt in part with solving the problems concerned with recovery and treatment of carbon black from the furnace effluent. This is considered more explicitly in the patents included in the following section. *J. Q. Wood (2,735,828 to Phillips Petroleum Co.)* proposes to recover the black by contacting furnace effluent with a viscous, pumpable mixture of crumb rubber, antioxidant, and extender oil, to which mixture the carbon black adheres. A similar idea is patented by the *same inventor in 2,719,135* in which the furnace effluent is contacted intimately with dried crumb rubber to which extender oil may have been added. In order to reduce deterioration of Orlon bags in carbon black collecting systems, *O. K. Austin (2,778,715 to Phillips Petroleum Co.)* proposes to introduce into the furnace effluent an aliphatic amine boiling below 250F, piperidine, or ammonia. A multiple collection system is suggested in *2,785,964 by L. W. Pollock of Phillips Petroleum Co.* to remove carbon black from effluent smoke. Several passes are made through a type of cyclone separator followed by electrostatic precipitation and bag filtering.

A facet of the product recovery problem is conversion of the furnace black into a conveniently handled form. This has been accomplished by pelletizing the product in the dry form or wet form, both systems having their own advantages. *H. S. Barbour of the J. M. Huber Corp. in 2,758,039* suggests first compacting fluffy carbon by the dry method to a density greater than 18 lb/cuft. The compacted carbon is then sprayed with water to about 5-25% of the weight of the carbon. The material dried after this treatment is in the form of free flowing, dustless, and strong pellets which disintegrate readily in rubber. *J. Q. Wood of Phillips Petroleum Co. (2,807,523)* patents a method for control of the pelletizing process. According to this inventor, the feed rate to a pelletizing process must be uniform; however, the density of recovered carbon black streams varies widely. In order to maintain a constant rate of feed, the density of the carbon black is determined continuously by subjecting the black to radiation. The emitted radiation is then measured and is representative of the density; the feed rate is adjusted in accordance with this measurement. A pneumatic system for conveying carbon black pellets to storage is described by *W. R. King and G. J. Webster in 2,837,415*. The gas-pellet disengager is a long vessel of such dimensions that the pellets of desired size fall. Fines and smaller pellets are recycled to the pelletizer. The delivery tube is flared at its exit to slow the emerging particles, thus minimizing pellet breakage. According to *2,850,403 (J. V. Day to Godfrey L. Cabot, Inc.)* stronger carbon black pellets may be produced by wet procedures if there is incorporated into the water a carbohydrate in the amount of 0.1-0.4 wt-% of the carbon black. The pellets are formed, dried, and then heated to a temperature sufficiently high to carbonize the carbohydrate. In a somewhat different approach, *J. A. Weaver of Columbian Carbon Co. (2,872,336)* claims to increase the crushing strength of wet pelleted black by including in the pellet 0.1-0.7% of sodium tetraborate.

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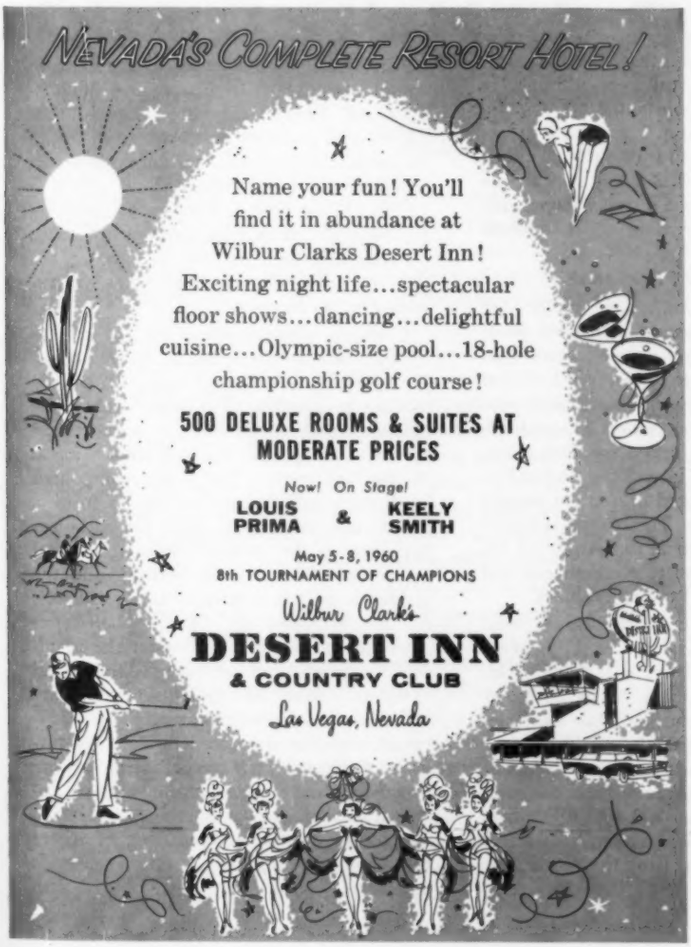
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According to *A. A. Bondi of Shell Development Co. (2,754,267)* carbon black is used in oil suspension for the preparation of greases and for the production of radiant flames, in steel mills for example. It is advantageous to have these suspensions as concentrated as possible consistent with pumpability; this patent suggests a method for accomplishing this end. Thus, 10-40% of carbon black particles less than one micron diameter are suspended in oil. The carbon particles contain on more than 10% of their surface a unimolecular film of an oil soluble, hydrolyzed copolymer of a straight chain alpha olefin containing 12-30 carbons and a vinyl ester. Suitable polyesters are polymers of vinyl formate, acetate, propionate, butyrate, and benzoate. The copolymer molecular weight should be between 4000-15,000. *H. A. Braendle (2,769,795 to Columbian Carbon Co.)* compounds carbon black and rubber without the use of dispersing agents and the like. The carbon black is mixed in predetermined amounts with flowing water under turbulent conditions; the slurry is immediately mixed with the correct amount of latex also in a turbulent stream. The resulting product is then immediately coagulated. The dusting properties of carbon blacks for rubber use are improved according to *2,813,040 (F. Rowe, Jr. and W. H. Rushford of Phillips Petroleum Co.)*. These inventors impregnate dry pellets with an extender oil in a drum impregnator.

AFTER TREATMENT

The next group of patents is concerned with various after treatments of the carbon black. *A. Weihe (2,793,100 to Deutsche Gold- und Silber-Scheideamstalt)* proposes to make coloring blacks by uniformly dispersing the black in an aqueous medium. The larger carbon black aggregates are then disintegrated by gases evolved during chemical decomposition of a reagent dissolved in the water; suitable reagents are ammonium nitrate, urea nitrate, aliphatic diazo compounds, or hydroxylamine. This same inventor in *2,793,101* sets forth certain desirable characteristics which printing ink blacks must have. These are: (1) high coloring power, (2) low viscosity in vegetable oil suspensions, (3) absence of thixotropy, and (4) adequate wettability.

Furnace blacks made from liquid hydrocarbons have high coloring power but are deficient in the other characteristics. These properties are improved by subjecting a slurry of furnace black in dilute ammonia to temperatures above 100C at superatmospheric pressure for times greater than one hour. The ammonia in the slurry reacts with the carboxyl groups of the carbon; the slurry is then cooled to 60-80C and packed as a paste. *I. Williams of J. M. Huber Corp. (2,793,134)* states that pelleted carbon black is difficultly dispersible in water to fine particles. He improves this situation by incorporating into the pellet a minor proportion of finely divided, dry, swelling bentonite in amounts of 1-40% based on the carbon black. *W. A. Schulze of Phillips Petroleum Co. in 2,794,749* discusses this same problem of the water dispersability of furnace blacks. This inventor states that furnace blacks produce more viscous aqueous suspensions than do channel blacks at the same loadings. His invention allows the incorporation of 15-25% furnace black into water at viscosities less than 1000 centipoises and pH less than 8.6; this is accomplished by using 0.5-1.5% of tannins or gallic acid containing materials; 1-2.5% of lignin, lignin sulfonates, or the salts of these, and 0.1-0.5% of alkali metal or ammonium hydroxide.

A method of carbon black surface modification is patented by *R. Antonsen of Godfrey L. Cabot, Inc. (2,807,577)*; the process consists in electrolytic oxidation of an aqueous carbon slurry. The oxidation takes place in the anode compartment separated from the cathode by a membrane permeable to water but not to carbon black. At least 0.002 Faradays per gram of carbon black are passed through the slurry.

The two following patents deal with after treatment of channel blacks. *A. Damusis (2,816,046 to Sherwin-Williams Co.)* claims that acidic channel blacks when used in paints absorb moisture from the air, react with accelerators, and decompose driers incorporated in the paint. If such blacks are used in rubber compounding they are dispersed with difficulty and have a tendency to react with accelerators. Damusis proposes to react these blacks with primary or secondary amines, hydroxy amines, or polyamines in order to form the amine salt. The salts are then heated to 105-130C for ½-2 hours in order to form the amide. It is claimed that such treatment converts the blacks to usable form. In *2,830,879, R. E. Dobbin and C. B. Beck of Godfrey L. Cabot* claim a method for producing channel blacks for coloring purposes. The black is after-tested while still on the channels by providing a series of alternating impingement and treating zones beneath the channels.

MISCELLANEOUS PROCESSES

We will now consider a number of patents describing some miscellaneous processes for producing carbon black. In *2,672,402, C. A. Stokes of Godfrey L. Cabot* proposes to make carbon black and synthesis gas in the same process. Liquid hydrocarbon is sprayed into a reaction space, and pure oxygen is introduced through a number of jets arranged in a circle around the hydrocarbon inlet. The oxygen is mixed with nitrogen free recycle gas. A part of the hydrocarbon is burned to synthesis gas and a portion is pyrolyzed to carbon black.

A process for making carbon black from carbon monoxide is claimed by *B. J. Mayland of Phillips Petroleum in 2,716,053*. The carbon monoxide is made by partial combustion of carbonaceous materials and then quenched to 1300-1900F by mixing with a recycle gas which contains a minor amount of particulate carbon and which has previously been cooled to 300-400F. The carbon producing reaction is then allowed to take place according to the equation: $2\ CO \rightarrow CO_2 + C$.

The carbon is mainly removed from the tail gas which is then cooled and recycled as described; carbon remaining in the recycle stream acts as a catalyst for the monoxide decomposition reaction. *R. G. Atkinson (2,731,328 to Phillips Petroleum Co.)* describes the manufacture of carbon from low grade hydrocarbon streams by use of a pebble heater.

A combination carbon black and hydrogen production process is claimed by *C. G. Kirkbride of Houdry Process Corp. in 2,794,709*. According to this patent pyrolysis of gaseous hydrocarbons is carried out by direct heat exchange with a bath of molten metal or salt. The charge preheated in this manner is then contacted with hot, fluidized carbon in the space above the molten pool; carbon black and hydrogen are thereby produced. A combination process for production of carbon black, acrylonitrile, and hydrogen cyanide is the subject of *2,796,327 (L. W. Pollock to Phillips Petroleum)*. The carbon black formed in a furnace is suspended in hot flue gases comprising hydrogen, carbon monoxide, and acetylene, amongst others. This gas is cooled by direct heat exchange with liquid ammonia. Ammonia reacts with the carbon monoxide to form hydrogen cyanide and with acetylene to form acrylonitrile. The carbon black is removed from the gas stream which is then cooled to condense and recover the nitrogenous chemicals.

In *2,796,331 (H. K. Kauffman, D. J. Griffiths, and J. S. Mackay of Pittsburgh Coke and Chemical Co.)* it is claimed that fibrous carbon, as distinct from carbon black, is made by slow pyrolysis of a mixture containing 20-80% methane and 80-20% hydrogen. Temperatures are between 1150-1450C and residence times are from 0.4 to 15 seconds. The fibrous carbon is then collected on an inert surface. *L. W. Pollock (2,796,332 to Phillips Petroleum)* proposes to utilize the combustion gases of a furnace by charging them as feed to a water gas shift reaction. The enriched gases are recycled to the furnace.

Catalytic decomposition of a gaseous hydrocarbon is proposed by *G. R. Bond, Jr. of Houdry Process Corp. (2,800,395)* for the production of carbon blacks. The catalyst comprises an inactive support and an active component selected from a metal of the iron group. The active component is characterized by the ability to form a volatilizable compound. After the carbon is deposited on the catalyst, the volatile metal compound is formed, distilled off, and the residue is used as a carbon black substitute. *R. L. McIntire of Phillips Petroleum (2,805,131)* patents a process for the simultaneous production of carbon black and acetylene. Both of these materials are ordinarily made in tangential flame furnaces; however, the acetylene does not survive long at the high temperatures existing in the furnace. This invention involves removal of a product containing acetylene at a point in the furnace upstream of where the combustion of the reactant gases is complete. END

Australia's Oil Hunt

(Continued from page 42)

Operating in Australia. The encouragement which the Federal Government of Australia gives to exploration companies is also unique in the world. American oil people who have worked in various foreign countries and encountered the myriad difficulties which are often thrown up are amazed to find a government which realistically faces the fact that oil is difficult to find and that foreign exploration companies should be helped.

Australia now imports its crude oil from Iran and Indonesia in almost equal amounts. The stability of both these countries as a continuing oil source varies from time to time. As a result, Australia well realizes that the final assurance of a smooth flow of petroleum products to her industry and transport requires oil fields on the Australian mainland.

Some of the problems often facing American operators in foreign areas, such as a highly inflated local currency which must be bought at fixed artificial rates, an almost complete lack of skilled local personnel, the necessity of importing nearly everything in order to carry on a minimum operation, and the usual language barrier, are missing in Australia. Australia, during the past few years, has stabilized its pound and strengthened its foreign currency reserves, especially in dollars. Thus, foreign investors should have no difficulties in taking out profits in dollars.

The Australian labor market comprises skilled people in all fields required by the petroleum industry. Thus, in setting up an operation, it is necessary to send only key American personnel. Geophysical contractors, as well, are finding that they can hire operators, computers, and surveyors in all the major cities and therefore most "American" crews actually have only an American party chief or supervisor. Australia is also well-supplied with many of the tools required for oil exploration. Although there are not enough seismic drills available nor specialized geophysical equipment, there appears to be a sufficient number of rotary rigs of different sizes. In addition, vehicles, camp equipment, and all the odds and ends necessary to set up an operation are readily attainable in both quantity and quality.

One difficulty encountered by American companies operating in Australia (which is a difficulty common to Australian companies as well) is the tendency for Australians to change jobs for no other reason than that they want to see or try something new. This is a result of that pioneering instinct which remains a characteristic of the country, despite the fact that the greatest part of the population lives in the major cities and larger towns.

Australia has been through the boom period following the abortive Rough Range discovery in Western Australia in 1953. The shakeout period, in which promoters and small local operators tied up acreage only to lose out as the government insisted on performance, is now nearing its end. In its place we see serious American interests setting up offices, moving in capable personnel and arranging sizeable programs with contractors in order to build up the geological knowledge from a strong base. It now appears that Australia will finally get the substantial, knowledgeable exploration necessary to uncover its oil reserves.

END

Refinery of Anglo Ecuadorial Oilfields, currently being expanded to 10,000 b/d to supply Ecuador's internal consumption needs. The unit shown being installed went into operation about the first of 1960.

AERO HUNTS OIL DOWN UNDER

New Australian airborne magnetometer survey for Magellan Petroleum Corporation will cover 30,000 square miles

Map shows 30,000 square mile area in Australia being surveyed by Aero Service Corporation for Magellan Petroleum Corporation.

Operating from two bases in Queensland – Charleville in the north and Longreach in the south –Aero Service crews are at work right now mapping petroleum concessions in a 30,000 square mile area of north central Queensland. The survey is being performed for Magellan Petroleum Corporation.

The high sensitivity Gulf airborne magnetometer, Mark III–a proved reconnaissance tool–is being used to determine the thickness of sedimentary sections of the area. An Aero spokesman explained that the instrument would also point out areas of unusual interest where anticlinal structures may be present.

The survey is being flown at an altitude of 2,000 feet. Flight lines are spaced at 3 miles, in an east-west direction. Magnetic data are being compiled at a 10 gamma interval, on maps at a scale of 1 inch = 2 miles. First maps are scheduled to be delivered by Aero Service crews about 45 days after completion of the survey.

This aerial survey represents Aero's second major surveying job in Australia. A few years ago Aero crews made an aerial survey of over 80,000 miles of Australian desert.

Aero experience is world-wide: from Alaska to the Spanish Sahara, Aero crews are carrying out airborne geophysical studies. Aero representatives will be glad to provide complete information on the experience and capabilities of the company. Crews are ready to undertake new assignment anywhere in the world. Find out how these "on location" crews can cut mobilization costs.

Aero Service's fully integrated mapping services include airborne magnetometer surveys, geophysical interpretation, aerial photography, photo interpretation, photo mosaics, pipe line surveys, relief models and topographic plans. It employs the Gulf magnetometer and RADAN,® Shoran, Lorac, Raydist and Decca plane-positioning systems.

Aero's DC-3 (above) is shown with Gulf high-sensitivity Mark III magnetometer trailing from aircraft.

Flights over featureless terrain are guided by Radan® doppler navigation. Survey plane is brought to starting point electronically. Maps or photos are not required. Pilot flies with guidance of Pilot's Direction Indicator.

Aero's representative in Australia is M. H. Lawrence, P. O. Box 6, Hurstville, New South Wales. In Europe and North Africa, W. P. Des Laurier at Avenida America 2-11-B, Madrid, Spain, is Aero's representative. World headquarters of Aero Service Corporation are located at 210 East Courtland St., Philadelphia 20, Pa., U.S.A.

OIL COMPANY STAFF CHANGES

D. F. Edwards

Dr. L. E. Arocha

DAVID F. EDWARDS, manager of the Bayonne, N. J., refinery of Esso Standard Oil Co., has been appointed employee relations manager of the new Humble Oil & Refining Co. (Del.). The appointment will become effective on approval of the Humble-Jersey standard merger by shareholders in meetings late in November. Mr. Edwards has been associated with Esso since 1926, and holds a Ph.D. from the University of Pittsburgh.

GEORGE G. THOMSON, JR. has been elected vice president of Asiatic Petroleum Corp. Mr. Thomson, who will be responsible for public and government relations, began his Shell career with the Caribbean Petroleum Co. in Maracaibo in 1947. He later served in various capacities with the Shell company in Colombia and as technical manager in Turkey. His last assignment before joining Asiatic Petroleum Corp. in early November was with the Shell International Petroleum Co. Ltd.

R. L. SAVAGE, Aramco's manager of manufacturing and oil supply, New York for the past two years, has returned to Dhahran, Saudi Arabia, where he has been reassigned as manager, plants and pipelines, reporting to D. J. Sullivan, assistant general manager, operations.

HOLLIS D. HEDBERG, president-elect of the Geological Society of America and formerly vice president of Gulf Oil Corp. has been appointed professor in the department of geology, Princeton University.

EDMUND DECHERD, formerly assistant comptroller for Magnolia Petroleum Co., has been appointed manager of exploration and producing accounting for Mobil Oil Co. Mr. Decherd will direct these accounting operations from Mobil Oil Co.'s headquarters in New York.

ALTON C. SAILSTAD, general manager of sales and a director of Standard Oil Co. (Indiana), has resigned. William H. Miller, assistant general manager of marketing since 1957, has been named general manager of sales and elected a director.

ALBERT V. FRASER, eastern regional manager for Standard Oil Co. (Indiana) in Detroit, has been named assistant general manager of marketing in the general sales department at Chicago. Mr. Fraser succeeds William H. Miller, who has become general manager of sales and a director.

J. ARTHUR KELLY has been appointed general attorney for Mobil Oil Co., the operating division of Socony Mobil Oil Co., Inc., for the United States and Canada.

T. N. LAW, Jr., exploration and landman, has been appointed vice president in charge of intercompany and public relations for Falcon Seaboard Drilling Co. of Tulsa. Mr. Law will continue his duties with the exploration department of Falcon Seaboard but will be in charge of an expanded internal and public relations program for the company.

C. F. BAIRD has been appointed assistant treasurer of Standard Oil Co. (New Jersey).

ROBERT E. YANCEY and **ORIN E. ATKINS** have been named administrative vice presidents for Ashland Oil & Refining Co.

DR. LUIS EDUARDO AROCHA, 41, legal advisor for Mobil Oil Co. de Venezuela has been elected a member of the board. The new director joined Mobil in 1954 after a distinguished professional career which included six years as professor of civil law at the Universidad de los Andes in Merida. Dr. Arocha is also a member of the newly formed "Camara de la Industria del Petroleo" (Chamber of the Petroleum Industry).

JOHN R. SPENCER has been promoted to director of natural gas activities for Continental Oil Co.'s production department. He succeeds **J. W. FERGUSON,** who recently was promoted to general manager of Conoco's newly established intrastate gas and gas products department.

J. S. HARRIS, formerly manager of Shell Oil Co.'s aviation department, has been named manager of the newly formed products and commercial sales group in the company's marketing organization. He will be responsible for six departments within this group. They are: aviation sales, lubricants-special products, fuel oil and liquefied petroleum gas, asphalt sales, national sales, and railroad sales. Mr. Harris will be succeeded by **R. M. ADAMSON,** aviation manager in Shell's San Francisco office.

DR. BERNARD N. ROLFE, formerly with the United States Geological Survey has joined Sinclair Research Laboratories, Inc., as assistant director of the exploration research division.

Other Staff Changes

PAUL WOLLSTADT, from assistant to the chairman of the board, to the newly created position of vice president—employee and public relations, Socony Mobil Oil Co., Inc. **DON SWEENEY,** from manager of Mobil International section of public relations, to manager of public relations, succeeding Wollstadt.

W. H. HAMMOND, from vice president, Ralph E. Fair, Inc., to Texstar Petroleum Co. as petroleum geologist and manager of exploration activities.

RAYMOND C. KECK, from advertising and sales promotion manager of Cities Service Oil Co. (Pa.) to manager of advertising department of Cities Service Petroleum, Inc. **ROBERT G. SHORTAL,** from United Press International to Cities Service news staff.

HOMER O. WOODRUFF, to assistant to the vice president, domestic producing, Texaco, Inc., in New York.

WILLIAM H. MONTGOMERY, from general manager of employee relations of Socony Mobil Oil Co., Inc., to general manager of manufacturing department of Mobil Oil Co., operating division for USA and Canada.

ALBERT F. BARRETT, from chief geologist of Mobil Oil of Canada to manager of producing, the new Denver exploration and producing division of Mobil Oil Co. **ARNE NIELSEN,** from vice president and general manager of Mobil Producing Co., to manager of exploration, Denver div.

HARRIS VAN ZANDT, to general manager of Pure Oil's exploration and production division, a new position.

DR. J. F. MASON, from exploration manager of Standard Vacuum, to staff geologist, Continental Oil's foreign department, in New York.

WADE G. MORIARTY to manager of producing, Midland Division, Mobil Oil Co., and **OWEN BLEXRUD** to manager of exploration. **E. L. DOWNING** to manager of producing for Houston Division and **PAUL E. NASH** to manager of exploration.

DON M. BROWN to assistant secretary, Aramco Over-Seas Co., in Arabia.

A. B. CRAMPTON, a division manager in Esso Export's aviation department to assistant general manager of marine sales.

JOSEPH G. SOLARI and **WILLIAM V. PHILLIPS** to vice presidents of Great Lakes Carbon Co.; Mr. Solari in charge of carbon division sales in New York, and Mr. Phillips continuing general manager of oil and gas division in Tulsa.

FRANK S. ENGLISH, Jr. to supervisor, products supply coordination in Ohio Oil Co.'s products distribution department.

GEORGE M. BUCKINGHAM to secretary, Esso Education Foundation, succeeding Claude L. Alexander, retired.

WILLIAM R. BOYD, JR.

William R. Boyd, Jr., 74, former president of the American Petroleum Institute and a nationally-known oil industry leader for three decades ,has died in Teague, Texas. Mr. Boyd received the Medal of Merit, the nation's highest civilian decoration in 1946, for his work as chairman of the Petroleum Industry Council for National Defense in World War II. He retired from the presidency of API in 1949. In addition to his oil industry activities, Mr. Boyd won recognition in local and national government. He was elected the first mayor of Teague, at the age of 21, when that city incorporated. He served as national campaign manager of the League to Enforce Peace, formed by William Howard Taft, and was active in the movement to form the League of Nations and enlist U.S. support of the League.

S. B. SARGENT

Sumner B. Sargent, 58, president of Sargent Engineering Corp., died October 18, 1959, of a heart attack while hunting with friends near Big Piney, Wyoming. As president of the firm, founded by his father, he had long been active in the petoleum production industry. In 1924 he and his father obtained one of the early patents on a rodless hydraulic pump which has been developed and has found wide acceptance in the industry.

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World's Safest Rig

R. J. Thames, right, Humble Oil & Refining Co. field superintendent, has been in charge of the company's Rig No. 39 for the past five years. This rig became the safest in the world on October 28 when 566,000 hours of work was completed without a disabling injury. Thames and driller W. H. Bassett are shown checking the log of the well in Lake Raccourci, Louisiana, the present location of the rig.

D. O. Givens

V. L. Snow

New Construction Company

O. R. Burden, president of O. R. Burden Construction Corp. Tulsa, has formed Universal Engineers & Constructors, Inc. Temporary headquarters will be at 6702 East 21st Street in Tulsa. Burden heads the organization as president. D. O. Givens has been named executive vice president and general manager. Verne L. Snow is vice president, H. D. Peters is treasurer and J. Ray Stough is manager of sales.

H. D. Peters

J. R. Stough

Petrolite Builds New Facilities

Work on the new Petrolite Ltd. manufacturing facilities in England is rapidly progressing toward planned completion on January 1, 1960. The new Petrolite facilities are located at Kirkby Industrial Estimates, near Liverpool. It is planned that the new plant will be in production by February 1960 and will shortly thereafter manufacture the full line of oil industry chemicals as offered by Petrolite Ltd. The Kirkby operations will be supervised by C. N. Stehr, managing director of Petrolite Ltd.

T. ORCHARD LISLE

T. Orchard Lisle, 73, died at Fort Worth on Dec. 1 last. Mr. Lisle formerly was executive editor of *World Petroleum* from 1929 to 1931 and subsequently executive editor and general manager of *The Petroleum Times* of London. More recently he was publisher of *The Oil Forum* before his retirement in 1956.

World Petroleum Statistics

FREE WORLD SUPPLY AND DEMAND, CRUDE AND PRODUCTS, APRIL 1959

(Thousands of barrels)

Source: USA Bureau of Mines, Division of Petroleum.

Country	CRUDE PETROLEUM: Production	Imports	Exports and reexports	Stock change, other demand, and loss	Total 1/ refinery input / Total 2/ refinery output	REFINED PRODUCTS: Imports	Exports and reexports	Apparent domestic demand (incl. bunkers)	Bunkers-all flags (as reported)
NORTH AMERICA									
Canada	13,392	8,240	2,564	-189	19,478	1,858	878	3/20,673	
Mexico	8,135	-	461		8,602	701	896	8,467	
United States (incl. Alaska)	217,685	22,270	230	+3,743	244,387	20,084	7,863	3/273,848	7,104
Subtotal	239,212	30,510	2,794	+3,715	272,405	22,037	9,077	302,988	
CENTRAL AMERICA AND CARIBBEAN									
Costa Rica	-	-	-	-	-	1/ 113	-	113	
Cuba	18	2,891	-	+198	2,117	1/1,282	-	3,399	
Dominican Republic	-	-	-	-	-	1/ 83	-	83	
El Salvador	-	-	-	-	-	1/ 144	-	144	
Guatemala	-	-	-	-	-	1/ 838	-	838	
Haiti	-	-	-	-	-	1/ 49	-	49	
Jamaica	-	-	-	-	-	476	-	476	
Nicaragua	-	-	-	-	-	1/ 90	-	90	
Panama, Canal Zone	-	-	-	-	-	1/ 559	1/ 273	286	1/ 384
Panama, Republic	-	-	-	-	-	1/ 173	-	173	
Puerto Rico	-	1,702	-	+69	1,789	848	1,065	952	
Subtotal	18	3,993	-	+961	3,846	3,355	1,238	5,963	
SOUTH AMERICA									
Argentina	3,563	2,486	-	-438	6,439	621	-	3/7,160	117
Bolivia	258	-	1/ 100	-10	1/ 168	1/ 10	1/ 1	177	
Brazil	2,001	3,405	1,840	-376	4,342	1/2,488	-	6,970	
Chile	512	203	-	-72	787	1/ 595	-	1,382	
Colombia	4,430	-	2,657	-3	1,825	-	309	3/1,473	
Ecuador	236	-	-	+11	225	5	-	230	
Netherlands Antilles	-	20,851	-	-3,786	1/26,134	1/2,800	1/26,800	2,734	
Paraguay	-	-	-	-	-	1/ 48	-	48	
Peru	1,408	-	326	-156	1,290	-	138	1,118	
Trinidad	3,273	2,982	468	+685	1/5,552	1/ 845	1/3,112	3,685	-/1,834
Uruguay	-	622	-	-12	634	487	-	1,121	
Venezuela	80,721	-	58,702	-1,931	21,947	47	19,280	3/1,180	1,470
Subtotal	96,402	30,429	63,436	-6,080	71,503	7,886	48,974	29,886	
WESTERN EUROPE									
Austria	1,389	1/ 300	1/ 600	+90	1,123	606	88	1,641	
Belgium and Luxembourg	-	4,150	-	-158	4,333	1,490	1,277	4,546	
Cyprus	-	-	-	-	-	1/ 195	-	195	
Denmark	-	-	-	-17	17	3,066	7	3,076	167
Finland	-	559	-	-41	1/ 600	335	-	935	
France	893	16,169	-	-241	17,303	1,171	3,239	15,235	
Germany, West	3,015	10,567	-	+2,005	11,577	3,698	1,318	13,751	
Greece	-	1,014	-	+47	967	138	-	1,105	
Iceland	-	-	-	-	-	163	-	163	
Ireland	-	583	-	+583	-	897	-	897	
Italy	962	14,457	120	-36	15,481	895	4,488	11,888	
Netherlands	1,011	10,739	-	+1,590	1/10,500	4,059	6,585	7,976	748
Norway	-	-	-	-41	41	1,842	-	1,883	
Portugal	-	1,063	-	+232	831	325	199	957	
Spain	-	2,897	-	+643	2,323	78	-	2,401	
Sweden	-	1,907	-	+787	1/1,200	4,713	131	5,782	
Switzerland	-	-	-	-	-	1,586	-	1,586	
United Kingdom	51	24,713	-	+388	83,836	10,299	4,999	3/26,209	2,598
Yugoslavia	255	1/ 420	-	+65	710	1/ 50	1/ 153	602	
Subtotal	7,676	89,618	720	+6,270	90,842	34,960	22,636	100,199	
MIDDLE EAST									
Aden	-	2,504	-	+539	1/1,965	1,418	1,104	2,879	2,058
Bahrain	1,352	5,444	-	+85	6,721	8	6,416	897	310
Iran	26,119	-	16,849	-527	1/9,797	-	6,044	3,753	
Iraq	24,371	-	1/23,871	-	1/1,100	-	-	1,100	
Israel	60	1/ 690	-	-	1/ 750	1/ 295	-	1,045	
Jordan	-	-	-	-	-	1/ 88	-	88	
Kuwait	47,421	-	43,413	+243	3,765	1/ 3	1,082	1,886	1,301
Lebanon	-	1/ 546	-	-	1/ 546	1/ 83	-	569	
Neutral Zone	3,443	-	1/3,000	-357	1/ 800	-	1/ 500	280	
Qatar	5,173	-	1/5,157	-	1/ 16	-	-	16	
Saudi Arabia	31,893	-	27,036	-207	4,464	33	2,944	1,575	
Turkey	197	-	-	+2	195	1,054	-	1,249	
U.A.R., Syria	-	-	-	-	-	640	-	640	
Subtotal	139,429	9,184	118,786	-822	30,109	3,587	18,970	14,786	
AFRICA									
Algeria	405	-	269	+136	-	785	-	1/ 591	185
Angola	24	-	-	+5	19	72	-	91	
Belgian Congo	-	-	-	-	-	359	-	359	
Canary Islands	-	1,795	-	+147	1,850	85	359	1,579	
Ethiopia	-	-	-	-	-	1/ 72	-	72	
States formerly in French Equatorial Africa	422	-	1/ 422	-	-	80	-	80	
French West Africa	-	-	-	-	-	1/ 339	-	339	1/ 983
Ghana	-	-	-	-	-	286	-	286	
Kenya	-	-	-	-	-	515	78	437	
Liberia	-	-	-	-	-	1/ 38	-	38	
Madagascar	-	-	-	-	-	51	-	51	
Morocco	57	-	-	-59	116	360	-	476	
Nigeria	198	-	1/ 198	-	-	539	-	539	
Rhodesia & Nyasaland	-	-	-	-	-	1/ 386	-	386	
Sudan	-	-	-	-	-	279	-	279	
Tanganyika	-	-	-	-	-	187	37	150	
Tunisia	-	-	-	-	-	883	-	3/ 216	
Uganda	-	-	-	-	-	97	16	81	
Union of South Africa	-	997	-	+215	782	1,939	85	2,636	
U.A.R., Egypt	1,750	1/1,100	850	-	1/2,000	1/1,110	1/ 18	3,092	
Subtotal	2,856	3,893	1,739	+444	4,767	7,059	593	11,652	
SOUTH ASIA, FAR EAST, AND OCEANIA									
Australia	-	6,481	-	+431	6,143	1,877	562	6,855	582
British Borneo	3,210	-	2,070	-210	1/1,350	1/ 37	1/1,382	65	
Burma	335	-	-	+43	292	1/ 57	-	351	
Ceylon	-	-	-	-	-	701	-	701	
India	255	1/2,814	-	+309	1/2,160	2,694	108	4,718	
Indonesia	10,500	1/1,791	5,846	-	1/7,395	1/ 194	1/4,801	3/2,527	1/ 386
Japan	203	10,789	-	+199	10,793	2,598	101	13,584	
Korea, South	-	-	-	-	-	46	-	46	
Malaya and Singapore	-	96	112	-16	-	3,461	1,912	1,549	
Netherlands New Guinea	145	-	1/ 145	-	-	-	-	-	
New Caledonia	-	-	-	-	-	1/ 31	-	31	
New Zealand	-	-	-	-	-	4,416	-	4,416	
Pakistan	185	-	-	-21	164	1/1,070	-	1,234	
Philippines	-	621	-	-176	797	1/ 562	-	1,359	
Thailand	-	-	-	-	-	704	30	674	
Taiwan	1	620	-	+46	575	12	-	587	
Vietnam, South (includes Cambodia)	-	-	-	-	-	1/ 232	-	232	
Subtotal	14,834	23,212	7,573	+1,245	29,631	18,106	8,833	38,713	
WORLD TOTAL EXCLUDING EASTERN EUROPE, U.S.S.R., & MAINLAND CHINA	500,427	190,839	194,988	+5,231	503,103	96,990	130,321	500,981	

1/ Estimate based on latest available data.
2/ Total input includes crude runs to stills plus runs of other unfinished oils, topped crude and natural gas liquids blended.
3/ Total output includes refined product output plus refinery fuel and loss.
4/ Domestic demand as reported, including stock changes.

Ethyl Appoints Lonergan

James B. Lonergan has been appointed advertising manager of Ethyl Corp. Mr. Lonergan will serve on the staff of Russell B. Weston, director of advertising, sales promotion, and merchandise management. Mr. Lonergan has been with Ethyl since 1943, and has been a member of the advertising staff since 1951.

Australia's Oil Story

The Petroleum Information Bureau (Australia), the public relations organization sponsored by the major oil marketing and refining companies of Australia, has established a Melbourne office in the heart of the city's busiest shopping area. The Bureau has adopted a policy of taking its story direct to the public by means of visual aids, in addition to making use of the traditional media of press, magazines, radio, television and lectures. It is thus able to present its story continuously to the thousands of people who pass its doors every day in Australia's second largest city which has a population of 1,750,000.

Hedberg Elected

Dr. Hollis D. Hedberg, vice president, exploration, of Gulf Oil Corp. has been elected president of the Geological Society of America at the recent annual dinner. Thomas B. Nolan of the United States Geological Survey, Washington, D. C. was elected vice president and the following were elected Councilors: Harold L. James, also of the U.S.G.S.; Vincent C. Kelley, University of New Mexico; George D. Woollard, University of Wisconsin; and Norman D. Newell, Columbia University.

Mid-Continent Movie Available

"720 Hours to sail," a twenty-five minute color-sound movie has been made available to interest groups. It depicts South American drilling operations shot on location and also the manufacture and shipment of ten complete drilling rigs to Argentina. Coverage of the spectacular 1959 International Petroleum Exposition is also a feature of this movie. The film has also been narrated in Spanish. Inquiry for use of this film should be sent to: Movie, Department of Public Relations, Mid-Continent Supply Co., Box 189, Fort Worth, Texas.

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Oil Field Diesels

The NH and V lines of Cummins Diesels meet the power needs required for *every* type of oil field application.

Ranging from 130 to 600 h.p. and from 4 to 12 cylinders, Cummins diesels are now serving the power requirements of compounded rig and independent slush-pump drives, auxiliary electrical services, spudding, camp utilities, and for rolling stock for rig-up and haulage . . . resulting in complete power by Cummins. This means standardization of parts, service and responsibility.

Consider the flexibility of the Cummins P.T. fuel system for the economy in using a wide range of fuel oil . . . important to foreign areas of exploration and wildcat drilling. Crudes may be used with suitable treatment in handling procedures.

Cummins manufactures diesel engines exclusively. Backed by more than 40 years of experience and research, Cummins offers a line world-famous for precision construction, rugged durability, long life, and dependability with minimum maintenance.

Cummins engines and parts manufactured in the U.K. and U.S.A. are available from more than 190 overseas sales and service points.

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Affiliate: Cummins Engine Company, Ltd. Shotts, Lanarkshire, Scotland

Rowley Heads Parkersburg

Craig M. Rowley has been elected president of The Parkersburg Rig & Reel Co., division of the Parkersburg-Aetna Corp. His offices will continue to be in Houston where the operating portion of Parkersburg executive offices are located. He previously served as executive vice president and general manager.

Phillips Plant In Italy

A carbon black plant will be constructed in Italy, according to a joint announcement by Phillips Petroleum Co., and Enrico Mattei, chairman of ANIC, S.p.A. An Italian company, to be known as Phillips Carbon Black Italiana S.p.A., will build and operate the plant, which will have an initial design capacity of 25 million pounds per year of oil blacks. It is scheduled to be in operation within two years.

ANIC is a company of the E. N. I. group engaged in refining and petro-chemical activities in Italy. Phillips is also constructing carbon black plants in France and South Africa in partnership with companies of these two countries.

Locomotives Explosion-Proof

A new line of explosion proof diesel hydraulic locomotives—designed for use inside petroleum and chemical processing plants handling explosive materials—are being placed on the USA market by Henschel-Werke GmbH of Kassel, West Germany.

New German Catalyst Producer

A new company, Kali-Chemie-Engelhard-Katalysatoren GmbH, has been formed by USA and German firms to manufacture and market platinum type reforming catalysts in Europe, the Middle and Far East. Located in Hannover, Germany, KCE has been organized by Engelhard Industries, Inc., of Newark, N. J., and Kali-Chemie AG of Hannover. The new company will produce Sinclair-Baker RD-150 and Atlantic-16 catalysts, making available a choice of two types under one license.

New D & D Officers

At election of 1960 officers of the New York Desk and Derrick Club Nell Hagaman, Shell Oil, was elected president and Jessie Halton, Ethyl, vice president. Other 1960 officers include: Adeline Dauzickas, Esso Export, recording secretary; Mary Tierney, Tidewater, corresponding secretary; Edna Lea, Esso, assistant corresponding secretary; Pearl Schram, Texaco, treasurer. Directors elected for a two-year term: Muriel Havens, Tidewater; Lillie Swanson, Sinclair; and Mary Zitkow, Petroleum Specialties.

Desk and Derrick is part of a national association of women of the petroleum industry. The chief purpose of the unique club is to aid women to become better employees through educational programs.

Multi-Fuel Diesel Engines

Hercules Motors Corp. has introduced a new line of diesel engines with an improved combustion system making possible the use of a wide variety of fuels—conventional diesel oil, kerosine, jet fuel, and gasoline. No adjustment is required when fuels are changed. The new line includes the first diesel engines designed specifically for light and medium trucks (up to 55,000 lb. gross combination weight). The engines range from 50 to 350 hp in three, four, six, and eight cylinder models.

Philippines Appointment

White Eagle Overseas Oil Co., Inc., Manila, Philippines, has announced the appointment of Glenn A. Campbell as general manager of drilling and production. White Eagle Overseas holds concessions covering approximately 770,000 acres in five separate locations within the Philippine Islands. The company was originally formed by Helmerich & Payne, Inc., Tulsa, which retained a minority interest following the sale of White Eagle Overseas common stock in the Manila investment market in 1958. Helmerich & Payne, Inc., continues to manage the company.

3 For 1 Split by Gulf

Shareholders of Gulf Oil Corp. have voted to amend the articles of incorporation, changing authorized capital stock of the corporation from 50 million shares with a par value of $25.00 each into 150 million shares with a par value of $8.33-1/3 each.

Earnings Rise

Petroleum company earnings continued their upward climb for the first nine months of 1959 in comparison to the same period a year ago. On the basis of 29 representative firms shown in the table below, the rise was 16.7%.

OIL COMPANY EARNINGS, NINE MONTHS
(In thousands of dollars)

	Net Income		Per Share	
Company	1959	1958	1959	1958
Arkansas Fuel Oil	4,249	4,701	$1.12	$1.24
Ashland Oil	14,349	10,332	2.09	1.51
Atlantic Refining	23,975	19,180	2.54	2.02
Cities Service Co.	27,301	25,760	2.54	2.40
Colon Oil Co. Ltd.	677	2,521	—	—
Continental Oil	45,330	33,863	2.15	1.68
Delhi-Taylor Oil	2,727	—1,056	0.52	—0.20
Felmont Petroleum	1,795	1,503	0.46	0.39
Gulf Oil	216,475	204,393	6.49	6.13
International Petroleum	15,800	13,100[1]	1.08	0.90[1]
MacMillan Petroleum	254	13	0.24	0.01
Ohio Oil	27,323	23,028	1.95	1.75
Phillips Petroleum	77,386	57,609	2.25	1.68
Pioneer Natural Gas	3,649	2,499	2.20	1.52
Richfield Oil	18,189	15,265	4.51	3.82
Sinclair Oil	35,025	31,814[1]	2.28	2.07[1]
Sinclair Venezuelan Oil	7,091	13,309[1]	1.77	3.32[1]
Skelly Oil	20,111	17,544	3.50	3.05
Standard of California	180,115	187,744	2.85	2.97
Standard of Indiana	106,189	86,449	2.97	2.42
Standard of Kentucky	11,183	10,442	4.29	4.01
Standard (New Jersey)	477,000	395,000[1]	2.22	1.93[1]
Standard of Ohio	17,959	17,474	3.59	3.50
Sun Oil	32,151	22,622	2.74	1.98
Tennessee Gas[2]	38,486	37,908	1.70	1.67
Texaco Canada Ltd.	7,499	7,120	2.28	2.16
Texaco Inc.	261,854	228,317	4.41	3.85
Texas Gulf Producing	2,879	2,524	0.71	0.63
Tex-Star Oil & Gas[3]	299	150	0.73	0.46
Tidewater	27,832	(328)	1.85	—
Union Oil of Calif.	19,900	20,830	2.43	2.54
Universal Oil Products[4]	1,813	—	—	—
Totals[5]	1,686,267	1,444,628		

Minus signs indicate deficit
[1]Adjusted to reflect Venezuelan income tax
[2]One-year period ending Sept. 30, 1959
[3]Fiscal years ending August 31
[4]Covers period Feb. 12 to Sept. 30, 1959
[5]Totals include only nine-month reports

Government Support for Oil

The recent meetings of the National Foreign Trade Council at the Waldorf Astoria approved a series of resolutions. The most significant resolution which indirectly affects the petroleum industry was titled "Sanctity of Contract and Protection against Expropriation." The resolution states in part: "It is the duty and responsibility of the United States Government to take whatever steps it can to protect the inerests of its own citizens and, specifically, to refuse to extend financial or economic assistance to governments which confiscate the property of United States citizens or corporations without prompt, adequate and effective compensation."

New Free China Tanker

The 700-foot-long S. S. FAITH, a 36,000 ton oil tanker, will be put into commission and carry crude oil from the Kuwait fields in the Near East to Taiwan's refinery at Kaohsiung. Except for turbines and special auxiliaries, the FAITH was built in its entirety by free Chinese workmen at the Keelung yards of the Ingalls-Taiwan Shipbuilding and Drydock Co.

JALMER E. SWANSON

Jalmer E. Swanson, 68, former president and vice chairman of the board of Graver Tank & Mfg. Co., died suddenly of peritonitis. He had served Graver for 47 years and was Graver's oldest employee in years of service. His quiet manner and complete dependability typified his company during his long period of leadership. Detailed and thorough, he worked long and tirelessly to carry on the Graver tradition for sound products, honesty and lastingly constructed. From these continued efforts, he won many friends in the steel and petroleum industries. He had just had the pleasure of seeing many of his old friends at the annual meeting of the American Petroleum Institute in Chicago.

Ohio Takes Over Marathon

The Marathon Pipe Line Co. has been incorporated as a wholly owned subsidiary of The Ohio Oil Co. Included in the transaction are the lines of Illinois Pipe Line Co. of Texas, also a subsidiary of Ohio Oil. The new company will operate 3,600 miles of trunk and gathering pipelines in Illinois, Indiana, Ohio, Montana, Wyoming, Nebraska, Mississippi, Louisiana, Texas, New Mexico and Michigan. Ohio Oil presently transports crude oil and refined products through its trunk pipelines at the rate of some 20-billion-barrel-miles a year.

New AAPG & SEG Officers

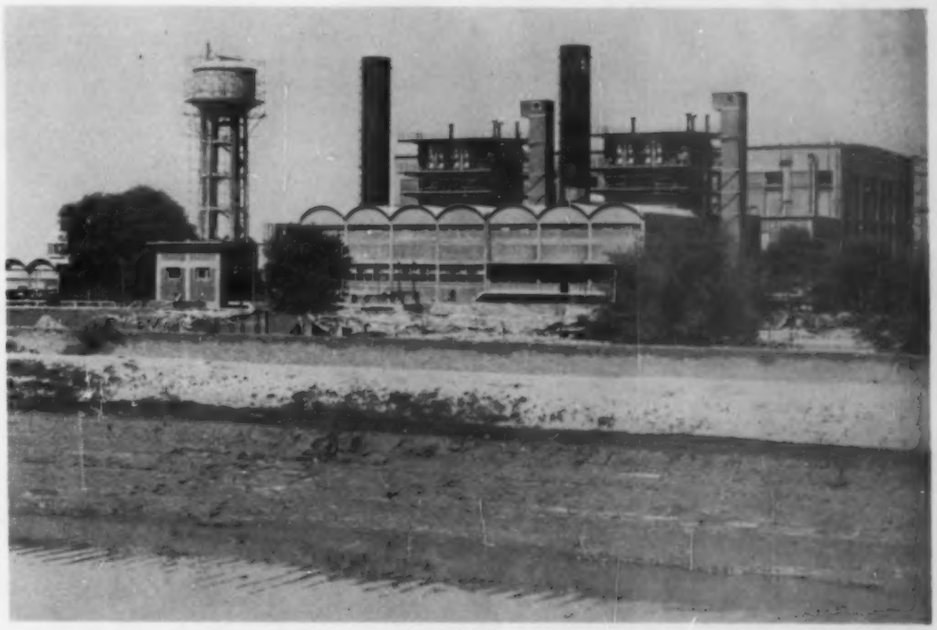
The following new officers will head the Pacific section of the American Association of Petroleum Geologists: President: Thomas A. Baldwin, Monterey Oil Co. Vice President: Orville L. Bandy, University of Southern California. Secretary: Gordon R. Bell, Western Gulf Oil Co. Treasurer: Richard B. Haines, Continental Oil Co.

Robert B. Moran, Jr., retiring president of the Society of Exploration Geophysicists, announced simultaneously the following new slate of officers: President: Forrest F. Lambrecht, The Texas Co. Vice President, Southern District: Nolen A. Webb, Richfield Oil Corp. Vice President, Northern District: M. C. MacMurrough, Standard Oil Co. Secretary-Treasurer: T. L. Slaven, Western Geophysical Co. Editor: W. L. Basham, Standard Oil Co.

Alaskan Gas Line

The Anchorage Gas Corp. will begin work on a natural gas pipeline to serve Anchorage, Alaska, from a production area recently discovered by the Union Oil Co. of California and the Ohio Oil Co. The Anchorage Gas Corp. has negotiated a firm gas purchase contract with Union and Ohio for an estimated 200 billion cubic ft. during the next 20 years. Construction is expected to commence in the spring. The pipeline, up to 12-inch diameter, will extend approximately 165 miles and cost $12 to $15 million. Anchorage's local gas distribution system will entail another expenditure of $4 million to $5 million. The Union-Ohio discovery is Alaska's first commercial gas production. The discovery is the Union-Ohio Kenai Unit No. 1 Well which has been tested and completed.

CONTRACTORS TO THE OIL INDUSTRY



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Mexican Gas Line Contracted

Collins Construction Co., Port Lavaca, Texas, and Constructora Inde S. A. de C. V. of Mexico City, have been awarded a contract for eight river crossings for the longest pipeline ever attempted in Mexico. The dual 24-inch and 12-inch water crossings are part of the construction on a 491-mile, 24-inch gas pipeline for Petroleos Mexicanos, and will connect Pemex City's new absorption plant in southern Mexico to industrial centers in the Valley of Mexico, near Mexico City. Feeder lines from the main line will also serve industrial centers along the way.

Long Beach Injection Begun

In a cooperative program undertaken by the City of Long Beach, Calif., and Wilmington Field oil producers water injection has been undertaken to halt land subsidence. The 6,800-acre Wilmington Field has produced some 830 million barrels of oil since 1936 and as a result a bowl-like depression has appeared at the surface ranging up to 26 ft. at the center.

Eventually it is planned to inject 1 million b/d of water at 2,000 psi. Current input is 435,000 b/d. Cost of the project will be borne by a charge against future oil production. It is estimated that the program will permit the production of 430 million barrels of oil without further subsidence.

Baroid Names Jones

Baroid Division National Lead Co. has appointed L. W. Jones sales manager of foreign operations. In his new capacity, W. B. Boutwell, Jr., formerly Baroid's district superintendent at Tyler, Texas, has been appointed sales representative in the company's foreign operations and will transfer to Houston. O. L. Riley, Jr., formerly area engineer at Long Beach, California, has been transferred to Alaska as sales representative.

inVEGArated!

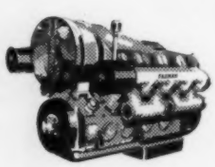
Now, for the first-time in the history of power engineering there's an air-cooled diesel in commercial production, with powers up to 466 h.p.

The VEGA—that's the name of this fine new diesel—is essentially a compact, lightweight 'slogger' . . . and that's a fact! Among the many oilfield applications for which the VEGA has been 'engineered', is the mobile rig . . . and just imagine it, no more water-cooling problems!

Specify Paxman Vega's—*for vehicle and rig drive*—for your next mobile rig, and take the many advantages which the VEGA offers . . . there's also complete interchangeability of parts and a second-to-none field service!

The VEGA is designed and built by the people with the widest experience in power engineering for the oilfields.

PAXMAN VEGA



air-cooled diesels

FOR OILFIELD DUTIES, FROM 160 TO 466 H.P.

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Spares service facilities to match oilfield requirements.

PO 6

Horton New CB&I Chairman

Arthur B. Horton has been elected chairman of Chicago Bridge & Iron Co. The directors also elected the president, E. E. Michales, chief executive officer; R. F. Hendren, executive vice president and treasurer; and E. S. Fraser, manager of plants. At an earlier meeting of the company's shareholders, John T. Horton was elected a director of the world-wide steel plate fabricating and construction firm.

A. B. Horton

G. E. Conner

Conner Heads Milwhite

George E. Conner has been elected president of Milwhite Mud Sales Co. of Houston. He joined Milwhite Mud Sales Co., Dec. 1, 1954 as a salesman. In 1955 he was promoted to sales manager and on Jan. 1, 1958 was elected to serve as executive vice president. Mr. Conner served in the Marine Corps as fighter pilot for 4½ years before he became associated with the oil industry.

J. Nini

G. W. Bowman

Milwhite Names Four

Milwhite Mud Sales Co. has named four new sales staff people. George W. Bowman has joined the Ft. Worth office, Jack Nini has joined the sales force at Midland, James N. Statton has transferred from New Orleans to Midland, and Ben Anderson has been appointed manager of the West Texas Division, with headquarters at Midland.

J. N. Statton

B. Anderson

Heads Avondale Advertising

Avondole Marine Ways, Inc., in New Orleans has appointed R. Raymond Ewart as advertising manager to succeed the late Henry LeFebvre. Mr. Ewart will work direct with the Avondale sales department, headed by R. Lamar Woodfin, general sales manager, with offices in the engineering and research building at Avondale's main plant at Avondale, La. Mr. Ewart was formerly design engineer with Avondale and has a widely diversified background in both engineering and advertising.

Shand And Jurs Appoints

George A. Fournier has been appointed manager of Shand and Jurs Co.'s New York district sales office. Mr. Fournier's advancement will free Mr. R. F. Ley, former manager of that office, to carry out special assignments with regard to the company's growing export accounts, in addition to his work with selected domestic accounts.

J. Behrenfeld

J. W. Brand

Crose-Perrault Merger

M. J. Crose Mfg. Co. and Perrault Equipment Co. Inc., are to be merged as the Crose-Perrault Equipment Corp., Tulsa. Both are engaged in the production of pipeline equipment.

John W. Brand will be vice president and general manager of the new company and will retain active management of the Canadian subsidiary, Crosse-Curran, Ltd. John Behrenfeld has transferred to New York as vice president in charge of exports. He begins a trip through Europe and the Middle East this month and will go to Latin America in June.

Ben Montgomery is a newly-elected vice president and will be in charge of the Houston division. W. H. Royal has been named sales manager.

Ben Montgomery

W. H. Royal

Beckman Appoints Bishop

Jane Bishop has been appointed supervisor of advertising services for Beckman Instruments, Inc., Fullerton, Calif. Mrs. Bishop will be responsible for providing art, production and traffic services for the company's corporate and division advertising departments. She assumes the new post after serving as advertising production assistant for Beckman's Helipot Division.

Petrolite Changes

Gordon S. Nees, vice president of Petrolite Corp. and general manager of the Petreco division, Houston, Texas, has announced that his division will be responsible for all equipment sales and process engineering for the Petrolite Corp.'s domestic and Canadian divisions. As a part of this move, the Tretolite chemical desalting process equipment now will be marketed by Petreco. TRET-O-LITE desalting chemicals will continue to be distributed and serviced by the Tretolite division refinery service staff.

Pfister Joins UOP

Emil Pfister, a veteran of the refining industry, recently joined Universal Oil Products Co. as a consultant. Mr. Pfister began his career in petroleum refining in 1920 at the Royal Dutch Shell laboratories in Amsterdam. Since 1929 he served as manager of the Royal Dutch Shell group of refineries in various parts of the world. Following the war, until his recent retirement, he was with Asiatic Petroleum Corp., New York, in charge of all technological matters connected with the refining and petrochemical industries.

Eimco Appointments

Two top management appointments were announced this week by Joseph Rosenblatt, president of The Eimco Corp. Wayne L. Dowdey, formerly manager of Eimco's Southern district, has been appointed general sales manager for the corporation. Paul O. Richter, Eimco vice president, has been named general manager of the Filter Division. Eimco has manufacturing affiliates in Canada, England, France, Italy, South Africa and Portuguese Africa, with agents and sales offices throughout the world.

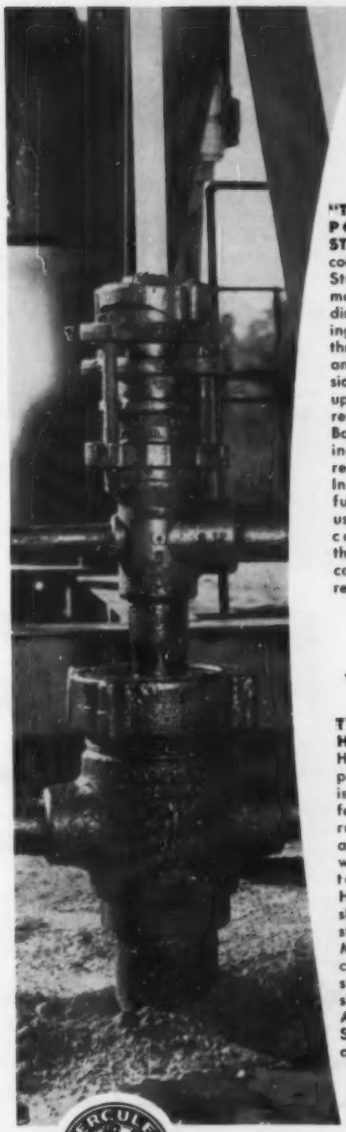
New Du Pont Additive

A new general purpose, ashless antioxdant based on a mixture of aryl amines now is available from the Du Pont Co. for use in greases, turbine and crankcase oils, and ester lubricants. To be marketed as "Ortholeum" 302 antioxidant, the compound when used as a stabilizer in synthetic lubricants, effectively inhibits viscosity change, copper corrosion, and acid number increase in high temperature oxidation tests. In automobile engine and laboratory bench tests, the new product reduces bearing corrosion, oxidation, and acid formation in mineral and synthetic oils as well as greases. "Ortholeum" 302 antioxidant, according to Du Pont Petroleum Chemicals Division, generally is effective at low concentrations.

NACCO Boosts Overseas Activities

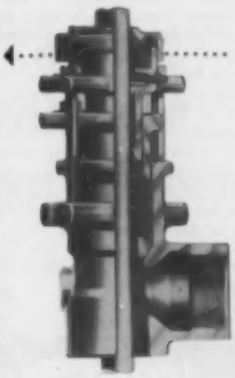
James L. Gibboney, vice president and director of Nalco Chemical Co., will increase his activities in the organization's international and general management operations, it was announced recently by J. A. Holmes, Nalco president. Mr. Holmes said the decision was dictated by Nalco's increased program of manufacture and sales in Europe, Mexico and South America.

HERCULES products in ACTION

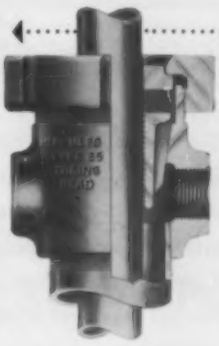


A typical set-up is shown below in Creek County, Oklahoma, using Hercules "Tee Type" Duplex Polished Rod Stuffing Box and Type "E5" Tubing Head. This is an easily assembled, effective and economical producing unit.

"TEE TYPE" DUPLEX POLISHED ROD STUFFING BOX—A combination Tee and Stuffing Box with female thread to screw directly onto the tubing, eliminating one threaded connection and resulting in a considerably shorter hook-up. With internal parts removed, the Stuffing Box body is full opening and need not be removed to pull rods. In addition to being furnished in the most used sizes, special combinations of threads and outlets can be furnished on request.



TYPE "E5" TUBING HEAD—This Tubing Head is ideal for any pumping situation. It is economical enough for shallow wells and rugged enough for any depth well, with working pressure up to 1500 pounds. Hercules self-aligning slips suspend the inner string in this Head. Mandrel suspension can be furnished instead of slips, if desired, at no extra cost. A neoprene Tubing Stripper Unit is also available.



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GENERAL OFFICES AND PLANT • TULSA, OKLAHOMA

Export Representative Oil Field Equipment Co., Inc. 90 West Street, New York, N. Y.

London Letter

(*Continued from page 22*)

ALBERT GREGERSEN, vice president of Gulf Eastern Co., a subsidiary of Gulf Oil Corp., has moved from London to Pittsburgh, Pa. to become production department coordinator. In London, Mr. Gregersen has been in charge of Gulf's exploratory and production operations in the Eastern Hemisphere. He will be succeeded as vice president, Gulf Eastern Co., by **T. D. LUMPKIN,** until recently vice president of Mene Grande Oil Co. in Venezuela.

T. D. Lumpkin

A. Gregersen

Mr. Gregersen, whose experience in the oil industry began in 1927, joined Gulf in 1945 as vice president and branch manager of the Danish American Prospecting Co., then a Gulf subsidiary with headquarters in Copenhagen, Denmark. In 1955, he was made staff representative for Eastern Hemisphere Production in Pittsburgh, a post he held until he was elected vice president of Gulf Eastern in 1957.

Mr. Lumpkin is a native of Amarillo, Texas and was employed in the legal department of Phillips Petroleum Company until 1941. He served in the Federal Bureau of Investigation during World War II. He joined Gulf in 1948 as manager, industrial relations department of Mene Grande Oil Co. in Venezuela, the position he occupied until he was elected vice president of Mene Grande in 1958.

W. H. Critchlow

E. W. Hardiman

Recent Esso Petroleum Co. (England) appointments include: **W. H. CRITCHLOW, MBE,** general manager (marketing) as a director of Cleveland Petroleum Co. and of Esso Petroleum (Ireland); Mr. Critchlow is succeeded by **E. W. HARDIMAN,** deputy general manager (marketing) since 1957; and **C. P. DALTON,** who has been appointed manager, coordination and economics department, succeeding **E. F. CHOPPEN,** who has been appointed a director of Esso Petroleum.

V. R. PREHN and **G. W. BONE** have been appointed joint managing directors of Ruston & Hornsby Ltd. on the forthcoming retirement of H. Rigall, managing director and deputy-chairman. Mr. Rigall continues as a non-executive director and as deputy-chairman.

L. SCHEPERS, a managing director of the Royal Dutch/Shell group, has been appointed chairman of Shell Chemical Co. in succession to F. A. C. Guepin, who has retired. **E. E. BULLEN,** finance manager of Shell Chemical since last April, has been elected to the board.

G. W. ATKINSON has been appointed area coordinator, North Europe, of Bataafse International Chemie Mij., and his position as manager of Shell Chemical Co.'s technical service laboratories at Egham (Surrey) has been taken by **Dr. E. S. PAICE,** assistant manager, Koninklijke/Shell Plastics Laboratorium, Delft.

NEW PUBLICATIONS

World Mineral Production in 1958, by the U.S. Bureau of Mines, Department of the Interior. A comprehensive statistical report giving country-by-country production of minerals throughout the world for 1958. The report covers 63 commodities—metals and metallic ores, nonmetallic minerals, and fuels, such as coal and petroleum, in 110 countries. Copies of the report, Bureau of Mines MMS 2979, "World Mineral Production in 1958," can be obtained from the Bureau's Publications-Distribution Section, Interior Building, Washington, D. C.

Oil and Gas Field Development in United States and Canada. By National Oil Scouts and Landmen's Association. This is a 1,136-page statistical review of oil and gas production and exploration throughout the US and Canada, including Alaska. It is an extremely detailed analysis, which covers the year 1958 and is designated Year Book 1959, Vol. XXIX. It may be obtained from the Association, at P.O. Box 1095, Austin 66, Texas.

Gravity Magnetics, an eight-page bulletin describing the use of gravity and magnetics in petroleum exploration, prepared by Geophysical Service Inc. and entitled, "Gravity-Magnetics . . . what they *can* and *can't* do for the explorationist." Specific examples of gravity-magnetics work and information on the key variables which must be considered in any gravity-magnetics program are discussed. The bulletin can be obtained by writing: The Marketing Department, Geophysical Service Inc., Box 35084, Airlawn Station, Dallas 35, Texas.

Louisiana Oil Laws Reviewed

Louisiana Rules—published by R. W. Bryam & Co., Drawer M., Capitol Station, Austin 11, Texas. An unusually complete three-volume collection of applicable Louisiana statutes for oil and gas production, continuously revised. Covers all the state, including statewide and offshore rules. Contains maps.

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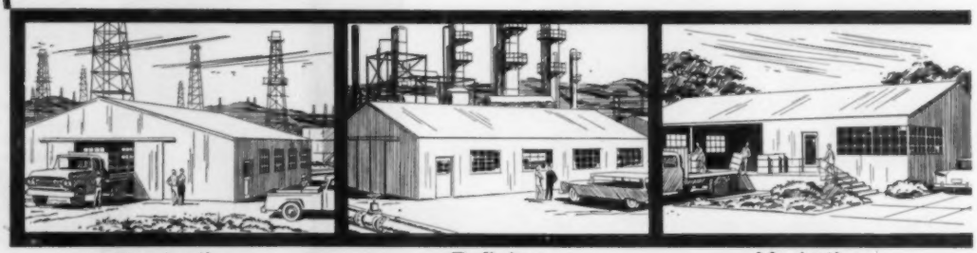

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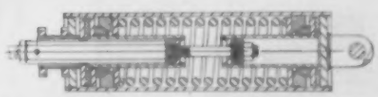

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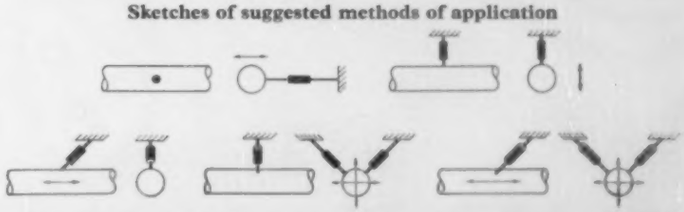

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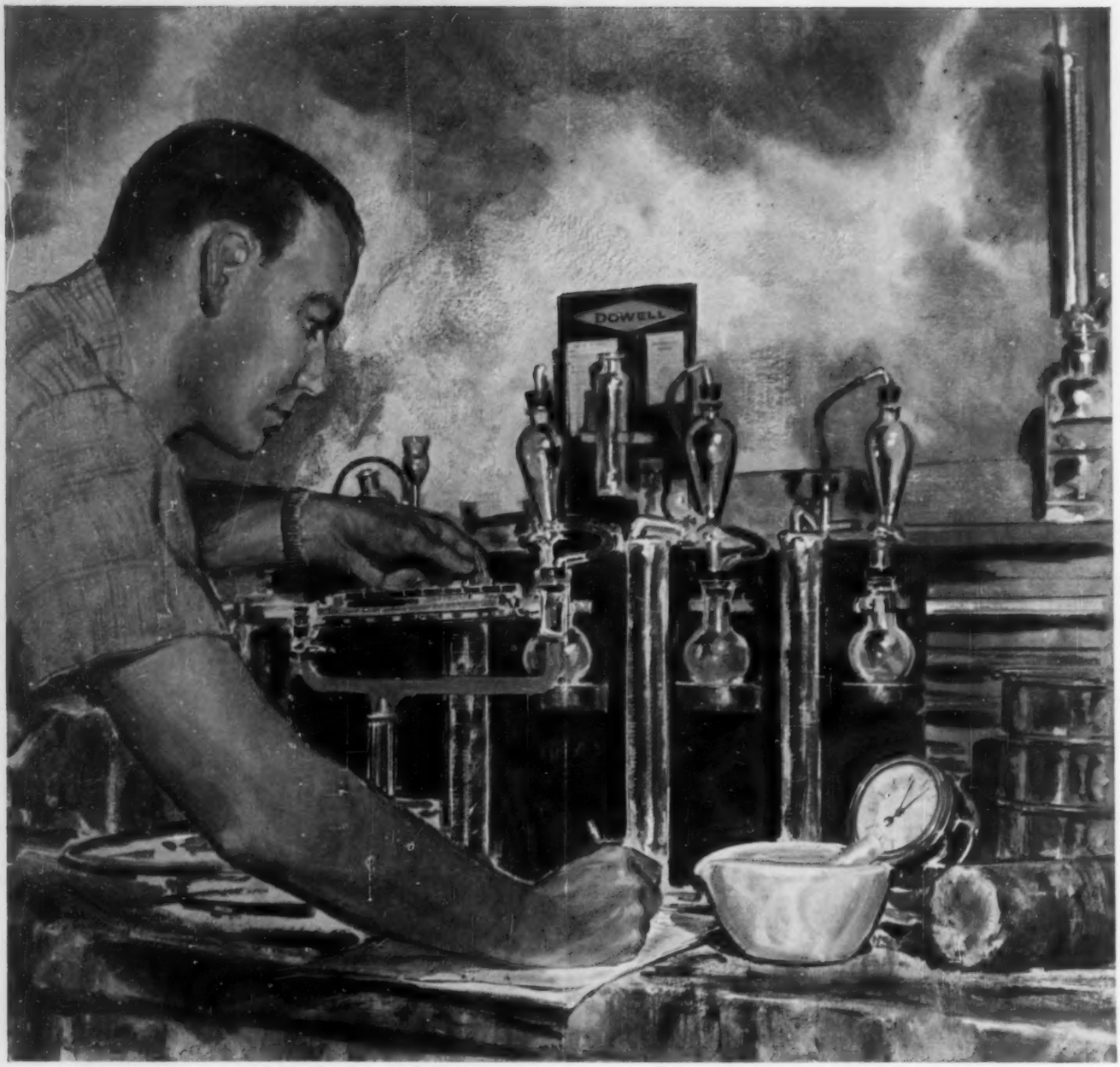

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